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# THE PARKS OF NEW BEDFORD

## The Splendid System Largely Due to Efforts of Mayor Ashley—Regulations for the Police and the People

*By Our Special Correspondent*

It has been stated that, in 1850, there were no public parks in the cities of the United States. This statement seems incredible when one considers that there are at present a total of 5,800,286 acres of parks, valued at about $500,000,000, in the 135 cities of 30,000 population and over in this country. Remarkable as has been the growth of park areas, there is much room for increase before the acreage of parks begins to approach one-twentieth of the total area of cities, the proportion which experts consider proper for the health and happiness of citizens.

It is but natural that some cities more than others should have realized the great importance of establishing park areas and so this total park area is not well proportioned among the cities considered. Taking the cities of from 60,000 to 70,000 population, statistics show that the largest of this group, Bridgeport, Conn., has a park area of 288.63; Lynn, Mass., 2,463.75; Oakland, Cal., 182; Lawrence, Mass., 129.33; New Bedford, Mass., 255; Des Moines, Ia., 521.48; Springfield, Mass., 490.03; Somerville, Mass., 52.10; and Troy, N. Y., 25. The cost of maintaining the parks in these cities varies greatly also and is out of proportion to the relative areas.

In some of the cities, especially those in New England, where the growth was slower than in western municipalities, the early citizens saw the need of surrounding their public buildings with natural scenery and so set them in the midst of small parks or arranged that the outlook should be on green grass and trees. The accompanying cut is illustrative of this and shows how New Bedford's city hall faces on a small park. During the past year the energies of the Department of Parks of that city have been devoted largely towards the improvement of Hazlewood Park, work on which was begun about a year ago.

A WINTER SCENE IN ONE OF NEW BEDFORD'S PARKS

In his report to the Park Board, Superintendent T. W. Cook suggested that one of the smaller parks be turned into a playground for children, as experience has proven that an increase in playgrounds is usually followed by a decrease in juvenile rowdyism, and the suggestion will probably be followed. The total expenditures for park purposes in the eleven years of their existence in New Bedford amounts to $308,837.29, or an average of $4.42 per capita of the population. The average annual appropriation for improvements and maintenance amounts to $19,092, or a per capita expense of but 22 cents, which, considering the benefits to be derived, would not be begrudged by any of the citizens.

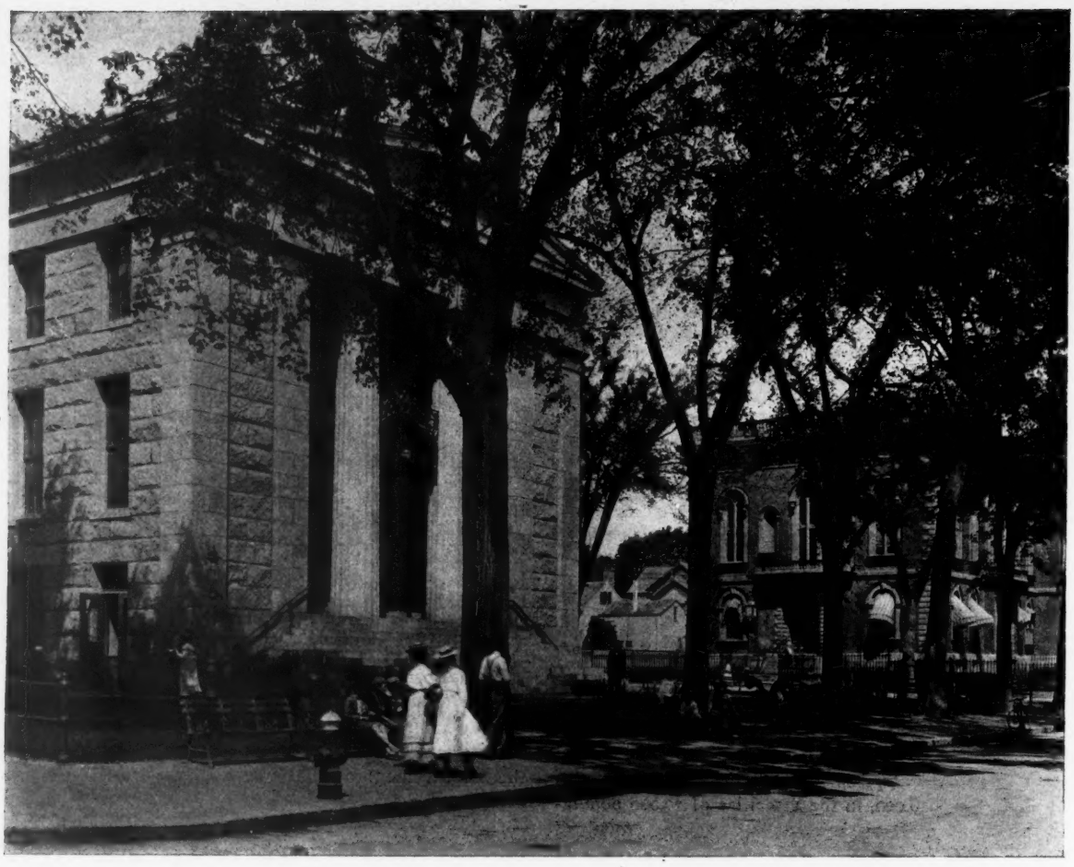
### RULES FOR PARK POLICE

The regulations which the Park Board has considered best for the government of the park police are as follows:

Sec. 1. The General Superintendent of Parks of the City of New Bedford, in addition to his other duties, shall have full and complete charge and control of the police force employed upon the parks, subject to such orders as may be from time to time issued or enacted by the Board of Park Commissioners.

Sec. 2. Regulations concerning the uniforms to be worn by the police.

Sec. 3. Policemen must be punctual in attendance, prompt in obedience to orders, and quiet and



CITY HALL PARK, NEW BEDFORD, MASS.

civil in the performance of their duties, and must give their names and numbers to any who may request the same, and their conduct at all times must be officer-like and above reproach.

Sec. 4. Every member of the police force is expected to use good judgment and discretion; yet, when necessity arises, must act with firmness and sufficient energy to properly perform his duty. He must at all times control his temper and refrain from the use of harsh, violent, coarse, profane or insolent language.

Sec. 5. Every member of the police force must have for his main object the prevention of crime and the enforcement of park ordinances within his jurisdiction, and he will exert himself to that end. He must examine and become familiar with every part of his post, and always be on the alert to prevent the destruction of trees, shrubs, plants, grass, turf or other property of the parks or commons.

Sec. 6. Policemen will familiarize themselves with the laws and ordinances governing the parks and commons, and be able at all times to furnish particular information relative to the condition of their posts and the location of park property.

Sec. 7. Policemen must, by their watchfulness, render it difficult for any person to commit a crime on their posts. Where offences frequently occur it is evidence of negligence or inability on the part of the policeman having charge of such post. Absence of crime is the best proof of the efficiency of the officer.

Sec. 8. Policemen shall carefully inspect every part of their posts regularly, but should police matters demand their attention and presence at any particular place, the regularity of inspection can be dispensed with, providing the policeman can satisfy the Superintendent that there was sufficient cause for such action.

Sec. 9. Policemen must constantly patrol their posts, unless otherwise ordered by the Superintendent. Failure to do so will be considered sufficient cause for their discharge.

Sec. 10. Policemen must not leave their posts until regularly relieved, unless it be for the purpose of taking a prisoner to the station house or patrol box, or to answer a call for assistance from an officer or citizen, or to make an arrest on view, or to follow an offender for the purpose of making an arrest.

Sec. 11. Policemen must not walk together or talk with each other or any other person while patrolling their posts, unless it be pertaining to police matters.

Sec. 12. Policemen must not use their batons or canes except in the most urgent case of self-defense.

Sec. 13. Should policemen observe in any driveway, lane or other place anything liable to be dangerous, of a public inconvenience, or anything that appears to them irregular or offensive, they shall immediately remove the same or cause the same to be removed; and, if impossible to accomplish this, report the matter promptly to the Superintendent of Parks.

Sec. 14. Every member of the police force must be furnished with a copy of these rules, regulations and ordinances, which he will keep in his possession and consult frequently, that he may become perfectly familiar with his duties.

Sec. 15. Pending any investigation for infraction of the rules and regulations, any officer may be temporarily suspended by the Superintendent.

Sec. 16. For any breach of the rules and regulations, and any of the following named offences, any member of the police force may be reprimanded, suspended or discharged: Neglect of duty; inattention to duty; sleeping while on duty; disobedience of orders; entering any place where intoxicating beverages are sold while on duty; intoxication; drinking any kind of intoxicating beverages while on duty; smoking while on duty; wilful maltreatment of a citizen; using coarse or insolent language to a superior officer or citizen; neglecting to treat all officers of the parks and all other persons civilly and courteously at all times; neglecting to wear uniform while on duty according to regulation, or neglecting to wear star or other emblem of office in proper position, or neglecting to appear clean and tidy at all times; leaving post while on duty without being relieved, or being absent from duty without permission; inefficiency.

### Regulations for the Public

The Board of Park Commissioners has also made certain rules which must be obeyed by the public as a condition of the use of the parks. Except with the consent of the Commissioners, all persons are forbidden:

1. To cut, break, injure, deface, defile or ill-use any building, fence, or other construction, or any tree, bush, plant, turf or any property whatsoever of said city, or to have possession of any shrub, plant or tree, or any part thereof.

2. To take birds, fish, or any live animals, or birds' nests, or in any way interfere with cages, boxes, or enclosures for their protection.

3. To throw stones, balls, or other missiles; to discharge or carry fire-arms, firecrackers, torpedoes, or fireworks; to make fires, to play musical instruments; to have for sale or otherwise any intoxicating liquors or beverages; to sell or offer for sale any goods or wares; to post or display signs, placards, flags or any advertising devices whatsoever; to play games of chance or to have possession of instruments of gambling; to utter profane, threatening, abusive or indecent language; to make orations or loud outcries to in any manner annoy other visitors.

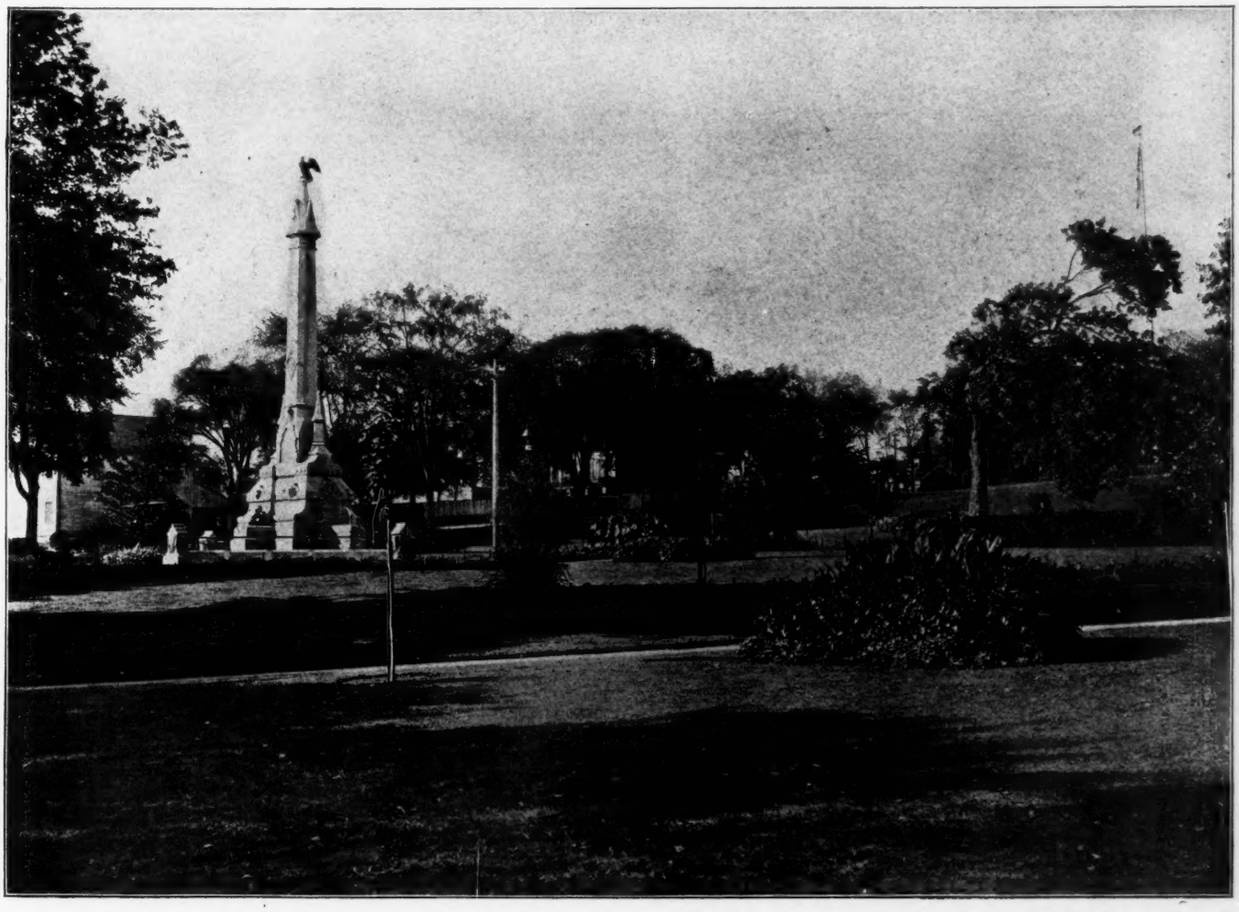
4. To play ball or any other games in any park, except such portions thereof as may be set apart for that purpose.

5. To drive any carriage, cycle, cart, wheelbarrow, hand cart or horse upon any park except upon regular carriage roads, and then at a rate faster than five miles an hour.

6. To drive or ride any horse or animal not well broken and under perfect control of the driver.

7. To refuse to obey the orders of the Commissioners, of the Superintendent of Parks, of the park police, or of any authorized agent of said Commissioners.

8. Any person wilfully doing either of the above forbidden acts shall be punished by a fine not exceeding $20 for each offence.



PUBLIC GARDEN AND COMMON, NEW BEDFORD

# MUNICIPAL *vs.* CONTRACT CONSTRUCTION

## The Advantages of the "Day Labor System" Over Contract Work—A Discussion Illustrated by Practical Results

*By James M. Head* *

*(Concluded from November.)*

As a practical illustration of what can and has been done by a city which does all of its public work in the way of street sprinkling, cleaning and repairing, building new streets, lighting its streets, parks, and all public buildings, and furnishing its citizens with water, I desire to give a brief summary of what has been accomplished by the city of Nashville, Tennessee, along these lines during the past twenty years.

In 1883, the letting of contracts under the old system by city officials to relatives, friends, and confederates, and the appointment to public offices of ward politicians, had reached such proportions and had become so objectionable that a popular uprising of the people demanded a change in the city charter taking away from the mayor and members of the City Council these powers and vesting in a Board of Public Works the power to make all contracts, inaugurate and supervise all public improvements, and making them generally responsible for the city's finances and the control of the public business. The duties of the City Council were confined almost exclusively to legislative functions, and the mayor given general supervision over all, with his actual power very much limited and restricted. In this latter respect, however, the power and duty of the mayor have since been largely increased, but the practical administration of the business of the city still remains with the Board of Public Works composed of three members elected by the people for six years, one member being elected every two years.

Under this system of municipal government the city of Nashville owns, operates and maintains its water works system, furnishes the city free of cost to the general taxpayers all water used for sprinkling 196 miles of streets twelve months in the year whenever needed; all water used by public buildings and charitable institutions; all water used for extinguishing fires; pays the interest on that portion of the bonded indebtedness of the city created for constructing the water works plant; provides all necessary funds for extending the system, and then leaves a neat surplus every year to be turned into the general fund of the city. This department of the city government has never become seriously involved in politics, one superintendent remaining in charge for nineteen years and then retired to accept a similar position with a privately owned water company in a neighboring city, at a salary under a contract for three years at double what the city of Nashville had been paying him. His successor has been in charge of the city plant for four years, and I feel sure that I cast no reflection on our former superintendent when I say that the

GYMNASIUM IN GROVE PARK, NEW BEDFORD

* Former Mayor of Nashville and President of the League of American Municipalities. Mr. Head read this paper before the seventh annual meeting of the League of American Municipalities, held at Baltimore, Oct. 7-9, 1903.—[EDITOR.

present management of the water works plant has shown more gratifying results than were ever achieved by any former superintendent.

The water works were first built by the city of Nashville in 1834, and there has never been a time when any respectable portion of the people would have seriously considered for a moment their sale to a private corporation. The rates charged by the city for water to private consumers are:

When more than 1,350 cubic feet is used by any consumer per quarter, the rate shall be as follows:

| Cubic feet per Qr. | Per 100 Cubic feet. |
|---|---|
| From 1,350 to 2,000 | 15 cents |
| From 2,000 to 4,000 | 14 cents |
| From 4,000 to 8,000 | 13 cents |
| From 8,000 to 16,000 | 12 cents |
| From 16,000 to 35,000 | 11 cents |
| From 35,000 to 75,000 | 10 cents |
| From 75,000 to 120,000 | 9 cents |
| From 120,000 to 240,000 | 8⅝ cents |
| From 240,000 to 360,000 | 8¼ cents |
| From 360,000 to 480,000 | 7⅞ cents |
| From 480,000 to 600,000 | 7½ cents |
| From 600,000 to 720,000 | 7⅛ cents |
| From 720,000 to 840,000 | 6¾ cents |
| From 840,000 to 960,000 | 6⅜ cents |
| For 960,000 cubic feet or over | 6 cents |

I refer to this fact as an evidence of the possibility, and at the same time the necessity, of keeping ward politics out of every department of the city government where efficient results are expected to be accomplished.

The engineering work for this department is entirely separate and distinct, and the parties in charge of this branch of the city's work are directly responsible to the Board of Public Works, as is the superintendent of the street department.

The city maintains such a plant of steam crushers, steam rollers, carts, wagons, teams, tools, and men as can be kept constantly employed at some public work all the year, whenever any work can be done, and during the busy season hires such additional teams and men as may be deemed advisable. In this way the city is placed in a perfectly independent position, and can practically dictate the price it will pay for teams and labor. The city authorities, however, have never hesitated and at nearly all times have actually paid more for labor than was being paid by private contractors for the same character of labor, and in this way the very best labor is secured and the best results accomplished. The city always pays promptly and in cash, and can always obtain the very best service.

SUNDAY BAND CONCERT, BROOKLAWN PARK, NEW BEDFORD

As an evidence of the practical results of this character of municipal management, this department of our municipal force does all the repairing of streets done in the city, and with a force of teams and men always on hand can do the necessary repairing at an hour's notice. It does all the grading for new streets, sidewalks and alleys, and practically all the building of new streets. The material, that is surplus dirt, and stone taken from the streets, sidewalks, sewers, water mains, alleys and curbing, is all used in grading new streets.

All large contracts for building trunk sewers are still let to private contractors, for the reason that the city has not felt justified in incuring the expense of such expensive machinery as is necessary to do this character of work in an economical manner. The city, however, has been prepared and has done its street building and repairing; has laid its branch sewers and water mains for several years,

### Street Department

The next largest, most important, and possibly most difficult department of municipal work to successfully manage free from the partisan control and manipulation of ward politics is the Street Department.

This department of our municipal work has been under the supervision and control of the same man for the past twenty-four years.

and, as an evidence of the economy secured by doing this character of city work by the municipality over the contract system, the statistics of our city show that the *lowest* price paid by the city under the contract system for macadam (simply laid on the streets without being rolled) was eight cents per bushel, or $1.76 per cubic yard, figuring twenty-two bushels to the cubic yard, while the *average* cost to the city under the contract system was twelve cents per bushel, or $2.64 per cubic yard. This work is now done by the city in a very much more satisfactory and workmanlike manner at an actual cost of less than one-half the *lowest* cost paid by contract, or three and one-half cents per bushel, or seventy-seven cents per cubic yard, and this cost includes rolling, sanding, etc., and, in fact, everything necessary to make a first-class macadam street. This is the *highest* cost at which any of this work is now being done, some of our streets actually costing as low as two cents per bushel, or forty-four cents per cubic yard, where the material is owned by the city and is taken from the quarry close to where the work is being done, or removed from some adjoining street where a cut is being made.

In addition to the above great economies, the satisfaction of being able to have the work done just at the time when needed gives additional advantages and enables the city, with much less money, to keep the streets in much more satisfactory condition than would be possible under the contract system. In the above estimates of cost the purchase of all machinery, wagons, carts, harness, horses, etc., all repairs, and the maintenance of the department are included.

### Bitulithic Paving

So thoroughly has the municipal construction of streets, lateral sewers, water mains, etc., over the contract system been demonstrated in our city, that when some two years ago the city authorities decided to try the construction of bitulithic pavement, under the Warren Brothers Company patents, when the first contract was made, it included an option to purchase a plant and continue the laying of this pavement under municipal control. When that trial contract was completed the city authorities and the public generally were so well pleased with this pavement, that the purchase of the plant at a cost of about $10,000 was immediately made and the construction of this pavement has been proceeded with under municipal control, and at very much less cost to the city than any contract I have heard of being made by any city where the work is being done under contract with the company which lays this patent pavement. While this pavement is being laid under the supervision of the expert representatives of the Warren Brothers Company, and in accordance with instructions furnished from its laboratory from the daily samples sent them for analysis and tests, the guaranty which the contractor is always required to make and for which the city must pay, is saved in addition to the profit which the contractor must make and the unexpected contingencies which he must provide for if he continues in business. All this is saved for the benefit of the whole public instead of going into the pockets of the private contractor.

During the current year, up to September 1st, the time when these estimates were made up, our city had graded and macadamized 3 37/100 miles of new street, in addition to the repairs made on all the old streets throughout the city, with about 140 miles of improved streets, and has laid 56,749 square yards of bitulithic pavement. It is contemplated that before the season closes 58,273 additional square yards of bitulithic pavement and about two miles of macadam streets will be laid. This does not include the 20,000 square yards of bitulithic pavement which the street railway company has laid under contract with the Nashville Roofing and Paving Company on that portion of the street between its tracks and for two feet on each side which it is required to keep up in the same condition that the city keeps the remainder of the street.

### Street Sprinkling Department

In no department of our municipal work has its advantages over the contract system been so strikingly demonstrated as in the sprinkling of our streets.

During the year 1893, the sprinkling of the streets was done by contract at a cost of $24,269.90 for sprinkling fifty miles of streets, some of which were sprinkled once, some twice, and some three times per day, or a total of 130 sprinkling miles. This work was very unsatisfactory to the public, especially during the first five months of the year.

For the year 1894, this work was again done by contract, there being no competitive bidding, and the contract was awarded for $18,042.50.

For the year 1895, the contract was again awarded to the same firm for the sum of $12,287,76 with a small increase in the number of sprinkling miles. For this year's contract there were competitive bidders which accounts for decrease in price to some extent.

During this year the city authorities decided to do this work under municipal authority instead of by contract, but were unable to secure the equipment until about March 1, 1896, the old contractors continuing to do the work during January and February of that year.

The total cost to the city for sprinkling its streets for the year 1896, was $18,745.12 including the purchase of thirteen new sprinkling wagons, five old ones purchased from the former contractors, and all the teams, harness and other equipment necessary for this work.

For 1897, the superintendent now in charge of this department of municipal work was selected and the cost to the city was $10,235.82.

For the year 1898, the total cost of this department to the city was $9,059.37, and included about ten miles of additional territory.

For the year 1899, the total cost was $13,044.45, and included a further ten-mile increase in sprinkling territory.

For the year 1900, the total cost was $13,060, which included the purchase of six new wagons.

For the year 1901, the total expenditures were $12,059.15.

For the year 1902, this department cost the city $14,098.78, including the purchase of ten mules.

At different times the amount of territory sprinkled has been increased from 130 miles in 1893, to 197½ miles in 1903, while for the year 1893, it cost $24,269.90, and for the year 1902, $14,098.78, and the city owns wagons and mules and harness, all of which have been paid for out of the expenses of the department since the city took charge. The greatest amount expended in any one year by the city was the first year that the city undertook the work, which was $18,745.12, or $5,524.78 less than the cost the first year under the contract system.

The average annual cost to the city for sprinkling 130 miles of street under the contract system for three years was $16,200.06, while the average annual cost under the present plan for seven years has been $12,900.38, out of which the city has paid for and now owns its entire sprinkling equipment necessary for the operation of this department.

During the years 1893, 1894, 1895 and 1896 when the contract system was in force the wages paid day laborers was $1.00 per day; while from 1897 to 1902, inclusive, the time covered by municipal work in this department, the rate paid was $1.25 per day.

My information is that a large number of cities still continue to do this work by contract instead of by the municipality where the work can be controlled and done to the satisfaction of the public to be served.

### Scavenger Department

This portion of our municipal work was never done by private contract but for one year, 1894, and the city that year paid for the work $18,826, which was the lowest of several competitive bids received, and the successful bidder lost several thousand dollars and failed in business in carrying out this contract.

The territory then covered by the city was considerably less than at present, and the work performed by the contractor did not include much of the work now performed by this Department, which includes sweeping every night, when not raining, six and one-half miles of paved streets; scraping whenever needed all macadamized streets in the city; cleaning and keeping open all gutters and catch basins throughout the city, and removing all ashes, trash, garbage, slops, etc., within the city limits.

The total cost of this department to the city for the year 1902, was $31,350; and while we have no means of knowing, I am reasonably sure that this service could not be performed for a city of 100,000 inhabitants by the contract system as well as it is now performed by the city authorities for less than $50,000 per annum.

### Electric Lighting

I will not detain you longer by detailed statements of what has

actually been accomplished by municipal construction in the city of Nashville as opposed to the contract system than to give you the result of the first year's operation of the Municipal Electric Light Plant built by the city, in contrast with the last year's cost of lighting the city by contract.

The total cost for lighting the city under the contract system had for several years been about $49,000 per annum, which did not include the lighting of the State Capitol and grounds or the parks; and the actual cash paid by the city for lighting its streets and public buildings for the year 1901, was $47,302.75. This gave to the city 382 arc electric lights of an estimated capacity of 2,000 candle power, the outages and inefficiencies upon which kept the city officials in a constant broil with the company on the one hand, and the citizens on the other. It gave to the city 539 gas lights with common tip burners, operated on a moonlight schedule, and furnished all necessary lights for the public buildings.

On October 1, 1902, the city accepted from the contractors its newly constructed electric light plant at a cost of $140,063.73, which included the cost of the building site and of the building, and took charge of lighting the streets and public buildings, commencing with 527 arc and 1,271 incandescent lights, and continuing the use of the gas lights in some sections of the city where the electric wires had not been extended, but cutting off all contract electric lights the first night. From the date of acceptance until January 1, 1903, additions to this plant were made at a cost of $13,916.93, making the total cost up to the latter date $153,980.66.

The successful operation of this plant has continued without accident or interruption from the day it was accepted by the municipal authorities, and we now have in operation 630 arc and 1,961 incandescent lights, 330 of the latter being of 60 candle power, and the total load carried being equal to 822 arc lamps.

The actual cost of operating this plant for twelve months has been $35,162.96, which includes interest on bonds, betterment, repairs, etc., and everything properly chargeable to operating expenses except depreciation, for which an allowance should, of course, be made. These figures include the lighting of the State Capitol building and grounds and the parks.

This plant does no commercial business, and is confined strictly to public lighting, but after the city had finally decided to construct this plant, the private company, which was then charging its customers eighteen cents per kilowatt, before the foundations for the city's plant were completed voluntarily reduced its price to private consumers from eighteen to twelve cents per kilowatt, and contracts are now being made with the private company for a term of years at five cents per kilowatt. You can make your own calculations as to the savings made to the people of Nashville when I say to you that the annual income to the private electric light company at the time the city commenced the construction of its plant was over $200,000.

The total expense of operating this plant from October 1, 1902, to October 1, 1903, has been $35,162.96. Had the light now being furnished to the city been supplied by the private company under the contract in force at the time the city took charge of its own lighting it would have cost the city, on a basis of the present load of 822 arc lights, $69,870, or $22,567.25 per year more than the city was paying in 1901, before it built its plant, and $34,707.04 more than it now costs.

CHILDRENS' MERRY-GO-ROUND IN BROOKLAWN PARK, NEW BEDFORD

The city of Nashville can well afford to supply all users of light and power at not exceeding six cents per kilowatt and provide for all expenses and contingencies, the extension and improvement of the plant to meet the growing demands of the city, and a sinking fund for the retirement of the indebtedness created for the construction of the plant. The actual cost to the city for producing electricity during the past twelve months has been 2.65 cents per kilowatt.

In the face of such highly satisfactory and practical results as these, I can see no good reason why every city should not, just as fast as circumstances and conditions will permit, take charge of

the building, cleaning and repairing of its streets and sewers, so essential to the preservation of the public health. And why this should not be followed by the municipality furnishing to its citizens at the lowest price and upon the most satisfactory terms possible water, light, telephone, telegraph and street car service. These utilities are now practical necessities and natural monopolies in every well regulated up-to-date city, and while I would not even suggest the effort to acquire all of these utilities at any one time, their gradual acquisition and ultimate control should be commenced by every municipal organization which has the welfare of the public at heart. Through a properly organized and well managed sysytem of municipal construction wherever it can be used all these results can ultimately be accomplished, the public welfare served, and the municipal government improved.

The conflict between the contract system and the private ownership of public utilities on the one side, and municipal construction and governmental ownership of all natural monopolies on the other, is irrepressible and must be fought to a finish with but one result possible in the end.

THE END

# KREODONE WOOD PAVEMENTS

## Successfully Used in Indianapolis and Elsewhere—Its Chief Characteristics—Carter Harrison Says It Wears Well in Chicago—How It Is Manufactured

*By P. C. Reilly**

In this city, in 1896, the first step was taken towards the present improved wooden block pavement. The blocks were cut from Washington cedar, a wood described by the Department of Agriculture, Division of Forestry, Vol. 9, 10th Census, Forest Trees of America, as very light, soft, not strong, brittle, rather coarse grained, specific gravity .38, weight per cubic foot 23.66. The specifications for treatment required that the blocks be dipped in creosote oil. Instead of dipping, however, the blocks were subjected to the same preparatory treatment for the reception of the oil as is now employed; and the oil was forced into the blocks by pressure. But as the price of treatment was based on the process of dipping, necessarily very little oil could be used, and only two and a half to three pounds of oil to the cubic foot were used, a quantity wholly insufficient for more than a brief, temporary effect. The blocks were cut 3 x 5 x 6 to 10 inches long, and 4 x 5 x 6 to 10 inches long. In the street they were laid close and then driven together; no allowance was made for expansion.

### Origin of Improved Wooden Block Pavement

These streets constructed of a wood entirely unsuited for paving purposes and only superficially treated with oil are classified as creosote block. They can hardly be so termed. But the result of this very light treatment demonstrated to the city authorities that creosote oil, even in small quantities, had a most beneficial effect on wooden blocks. For these pavements, compared with precisely the same kind of pavements laid without any treatment, showed much greater resistance to wear, and for nearly five years the surface of the block remained non-absorbent to the extent that after a rain the surface remained dry and did not broom or soften, while the untreated, after a rain, immediately broomed and became soft and spongy.

The city authorities quickly recognized that cedar was not the wood to use, and that the oil treatment was deficient in quantity. The following year the specifications were changed. Long leaf yellow pine—a wood described by the Department of Agriculture, Division of Forestry, Vol. 9, 10th Census, as heavy, exceedingly hard, very strong, tough, corse grained, compact, durable; specific gravity, .70; weight, per cubic foot, 43.62 pounds—was substituted for the Washington cedar and the quantity of oil increased to ten pounds to the cubic foot. These specifications remained unchanged for two years, when the city again increased the quantity of oil to twelve pounds, pounds, or 20 per cent. The result of the increased quantity of oil did not give to the blocks the waterproof qualities the city expected it would, and which it deemed necessary they should possess; for, when the blocks were driven close together, the expansion caused the blocks to raise in spots, generally in the gutters next the curb. The cause was two-fold, the creosote oil was seriously defective in many particulars, especially in permanency, and insufficient in the quantity used. The city's judgment, however, that a long leaf yellow pine block treated was a most durable pavement, was fully substantiated, for the blocks in the earlier pavements show practically no wear, and what there is, is uniform. In fact, there is the wonderful record that in the many miles of streets in this city and in other cities there is not the slightest unevenness in wear. There is not a single block showing greater wear than the entire body of blocks, and none of the blocks show any deterioration. But believing that twelve pounds of oil, if it were of the proper quality, were sufficient for the purpose of preservation, and for the purpose of thoroughly waterproofing the blocks, the next step by the Board of Works was an examination into and a study of creosote oil. Samples were obtained at different times from the chief distillers in the country, and frequent tests were made. It was a most important and a most fortunate investigation, both from an educational and a practical view point, for it conclusively showed that which is known commercially as creosote oil varied very greatly in quality, was extremely volatile under temperature much less severe than that to which blocks in the street are exposed, therefore, lacking in fixity, and more or less soluble in water, some considerably so. The dependence that had been placed in commercial creosote oil proved to be unwarranted, and that the general specification, creosote oil, would not be productive of satisfactory work. To fill the requirements Kreodone creosote oil was presented. It was uniform in quality, possessed great resistance to heat and atmospheric influences, and was much less soluble in water than any of the others. Since then it has been made practically insoluble in water.

### Experience with Wood Pavement Elsewhere

At the time of the introduction of this form of pavement there were no references obtainable that were of practical assistance. We had recourse to three. The creosoted block pavements in New Orleans and Galveston, the reports in the Government office on the efficacy of creosoting, and the success in London and Paris and other European cities of creosoted block pavements. The Galveston and New Orleans pavements were laid with wide interstices, filled with sand—very inferior and unsatisfactory construction: First, because the joints were dirt gatherers and distributors; and, second, because blocks set apart, round at the edge, as does granite. We learned nothing of the expansion of the blocks because the wide joints provided for it and it was not noticeable. The Government records referred generally to the treatment of timbers, marine work, railroad sleepers, etc., but not to paving blocks. The reports from Paris and London referred to heavily travelled streets, where in many instances the streets wear out before they could deteriorate. I have not the slightest doubt that, for a continuously heavily travelled street as is found in these cities, a light treatment would suffice. The travel itself crushes the blocks to such an extent as to make them watertight.

We had presumed, from these references, that all that was needed was to inject creosote oil into the block to protect it against decay and that then the work was done; that the blocks could be driven together in the street. Experience quickly obtained, soon taught us that preserving a paving block was a very good thing, but it was

* Mr. Reilly is a resident of Indianapolis and is an expert on wood pavements. By request he prepared this paper and read it before the recent convention of the American Society of Municipal Improvements, held in his city. It is here published by courtesy of the author.—[Editor.

only a part of the work to be done; the other part was that the block should be made proof against absorption.

In this connection I might suggest that creosoting wood is partly similar in intent to the tanning of hides, as in leather making. The proper oil has somewhat the property of combining with the fibre as tannin combines with the fibre of hides, to form a non-putrescible compound. This compound may or may not be waterproof according to the circumstances, and besides the oil needed to fulfill this "tanning" of the wood fibre, enough oil should be used to fill the intercellular spaces of the wood and waterproof the block as a whole, by absolute exclusion of water from the interior of the block.

### A Block of Great Resistance Required

It is required that the wooden paving block be of such a character that it possess great resistance, that the blocks be laid perfectly close together and be proof against the elements. Long leaf yellow pine is the principal wood used so far, though where fir, tamarack, elm, beech and Norway pine are more accessible, either of these woods can be used. In its green state, long leaf pine weighs about fifty-eight pounds; dry, about thirty-eight pounds to a cubic foot. A cubic foot of dry timber contains twenty-five five-tenth pound volume wood substance, and thirty-seven pound volume voids. One-half of these voids is in the fibres; the other half is intercellular, that is, voids among the fibres of the wood. These voids of intercellular spaces should be filled with an oil possessing not only germicidal and preservative properties, but oil that is waterproof in character, that will firmly adhere to the fibre, and will remain fixed in the pores. Every one of these features is essential to the success of the pavement. The resistance of long leaf yellow pine to crushing strength is about 8,500 pounds to the square inch, a resistance much in excess of any weight or traffic it may be called upon to bear. This is its inherent strength. It is a disputed point among scientists whether the treatment of timber increases its strength or not. A celebrated German scientist, Dr. Boehme, Vol. 9, 10th Census, says it does, and that the increase is about 20 per cent., but it is an unsettled question. Considering the matter purely from the standpoint of paving, exposed to alternate wetting and drying, I should say that the fibre of the wood is not increased in strength in the treated block, but that it is so protected that it retains its inherent strength. To emphasize this point more fully, if a thoroughly dry pine block and a Kreodone block made from the same stick were placed side by side under cover and subjected to the same traffic conditions, the untreated block possibly would wear as well as the treated block; but in the street subjected to wetting and drying, the untreated block when wet, would become limp and very susceptible to destruction, whereas, the fibres of the treated block, being impervious to water, would be dry on such exposure ,and, therefore, would always possess their inherent strength. The theory has been advanced that some of the materials used for preserving timber, because it fills the pores, supports the fibre. As the material injected of itself does not possess any power of resistance to compression, I do not believe it adds anything to the strength of wood except in the way of protecting the fibres as I have mentioned.

### The Greater Value of the Treated Block

I shall assume, therefore, that the strength of the wood is not increased because of the treatment, but that it simply retains its inherent strength. I will assume a dray weighing 4,000 pounds, carrying 20,000 pounds, total 24,000 pounds; the tires three inches wide, and the periphery of the wheel resting three inches on the pavement, or nine square inches to a wheel. The compression on the pavement in this case, which is an extreme one, would be only 667 pounds to the square inch, or about one-thirteenth its power of resistance. If, however, the blocks be so treated with an unchangeable, fixed material that will retain its strength under all conditions and for all time, they will make a most durable pavement.

I have stated that there are about twenty-pound volumes voids in the intercellular spaces of the block, which means that it will require twenty pounds of material to perfectly coat the fibres of the wood and to fill the pores, and this is the quantity I should advocate using. But, I might be asked the question, that if the Kreodone oil be waterproof and unaffected by heat and cold, and the fibres of the wood be coated with it, what possible injury could occur to the fibres, or to the constructed pavement if water did not enter the pores? And again, I might be asked, what would be the purpose of using a greater quantity of oil than is required to coat the fibres? I will here read a report of tests made by the city engineer on Kreodone blocks filed by two bidders last June. These tests show that blocks treated with twelve pounds of Kreodone oil were impervious to water. But there is this possibility, that if the minimum quantity of oil be used, some of the fibres in some of the blocks may not be completely coated, and, therefore, using the minimum quantity we go too close to the factor of safety. If the intercellular spaces are filled with Kreodone oil we know that the fibres are not only absolutely coated and protected, but that the block itself is imprevious to water.

### What the Kreodone Wooden Block Is

What is the Kreodone wooden block as now constructed? It is a wooden block possessing great powers of resistance, unchangeable in character, and having an absorption of moisture less than brick. In the street the blocks can be laid close together, and in this way get the superior construction due to the edges of the blocks supporting each other, making a practically continuous surface. No pavement, not even granite, will wear as well. I do not wish to be understood as claiming that Kreodone block has as great resistance to compression as granite, nor do I wish to be understood as claiming that the Kreodone block will last longer than the granite block; but I do claim that under the same conditions of traffic, because of the solid unyielding character of the granite, that the Kreodone block will remain a good pavement very much longer than granite. This statement is conclusively proven by the great durability shown by the Kreodone block pavement on the Rush Street Bridge, Chicago. This is the most heavily travelled piece of roadway in the city of Chicago, if not in the United States. Mayor Harrison, in his report to the City Council, in referring to the excellent wearing qualities shown by the Kreodone wooden block pavement, spoke of the traffic as follows:

"The traffic on this bridge is of the heaviest character, being narrower than the street on both sides of it, and carrying all the light traffic of a large portion of the North Side in addition to the heavy traffic from the wholesale district. From the river docks and from the railroad freight houses, the paving is subjected to what is, in all probability, as severe and exacting a test as any single piece of paving is put to in Chicago."

The wear of the block will average about one-eighth of an inch per annum, and is absolutely uniform throughout the pavement.

Another feature, which is worthy of mention, is the ease with which this pavement can be repaired. In many cases, where telephone companies and other companies, had to cut through the pavement, the replacing of the pavement has been so skillfully done that it is hardly noticeable where the pavement was removed.

Tests by the city authorities for this or any other treated wooden block pavement should be made with the treated block as it is prepared for the street. It should be ascertained whether it expands and contracts under heat and cold, whether it absorbs moisture and expands, whether the oil is a fixed oil, and the gravity of the block taken to see if it has had the treatment called for in the specifications. The chemical tests necessary to be made are such as will show that the oil contains no ingredients inconsistent with true creosote oil products.

Kreodone block, as a result of experience in manufacture and public use, is now a street material which, besides possessing the conceded good points of wood, is wholly indifferent to wet, dryness, heat and cold.

# SEWAGE DISPOSAL IN PROVIDENCE*

## The Chemical Precipitation Method Employed—Cost and Operation of the Plant—Health of the Community Safeguarded

*By Our Special Correspondent*

The work of the larger municipalities often overshadows that in the smaller cities, largely because of its magnitude. For this reason, the general public is inclined to give but little credit to the smaller municipalities; it too often ignores their work, or considers it unimportant. As a matter of fact, the same problems confront all cities, and the engineers of the larger cities oftentimes might learn a great deal from those in the smaller cities if they were so disposed. The construction of the Wachusett Reservoir, in connection with the Metropolitan Water System of Boston, the drainage canal of Chicago, the filtration plant of Philadelphia and the Croton Dam of New York are all engineering feats of large magnitude, but are no more difficult than some of the problems that have been solved by smaller cities.

### Plant Operated Nearly Two Years

For nearly two years, the city of Providence, R. I., has had in operation a chemical precipitation plant for the disposal of its sewage, which has met the expectations of its designers in yielding beneficial results, among which are to be included the improvement of the harbor and upper Narragansett Bay, not to mention the general sanitary benefits derived. Providence, with a population of 185,000, situated at the head of Narragansett Bay, thirty miles from the ocean, the shores of the Bay dotted with summer cottages and pleasure resorts and its waters used extensively for fishing and the cultivation of oysters and clams, faced the necessity some few years ago of purifying its sewage in order to promote the general health of the community and to prevent further pollution of the Bay.

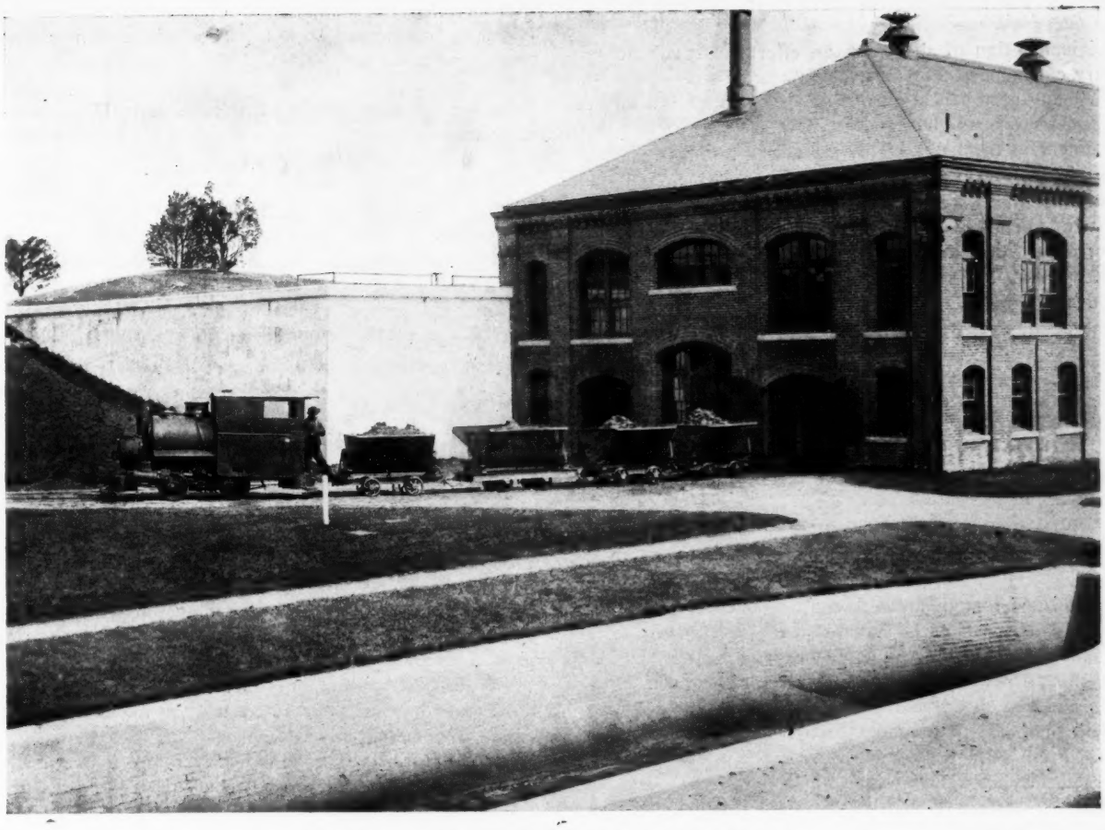
The matter was talked over for several years, and finally the work of improving and extending the old sewer system was commenced. The regular sewer system, which has cost up to date $3,782,210.43, comprises about 164 miles. The intercepting sewers, comprising a system of about thirty miles in length, have cost $2,967,842.73, and an additional outlay for land for stations, rights of way, etc., of $141,676—the total cost of the plant amounts to $3,692,011.57. When the necessity of purifying the sewage was first realized, Mr. S. M. Gray, then City Engineer, was sent to Europe to examine its methods. Mr. Gray found, upon his return, that the only system which could be adapted to conditions in Providence was that known as the Chemical Precipitation Method. There was not sufficient room for the installation of any other system, and the expense involved of carrying the sewage to more distant points was too great.

### Intercepting Sewers a Part of the System

Following the investigation and report of Mr. Gray, the construction of the intercepting system of sewers, which was a necessary part of the plan providing for the ultimate successful disposal of the sewage of the city, was commenced in 1890. The system was so far completed by the spring of 1897 that the pumps were started and the sewage emptied crude at Field's Corner. In the following year,

* In the preparation of this article, our special correspondent wishes to acknowledge the courtesies extended by the present city engineer of Providence, Mr. Otis F. Clapp, who not only furnished data, but also loaned the cuts used herewith.—[Editor.

PRECIPITATION PLANT, FROM THE SOUTH-EAST



ENGINE AND CARS USED TO TRANSPORT SLUDGE AND LIME

the construction of the precipitation plant was begun, and by September, 1901, the continuous treatment of sewage was started, and since January 1, 1902, the full plant has been in operation. The average daily flow of sewage from the entire sewer system aggregates about 17,000,000 gallons. This sewage is naturally stronger in the day time than at night, as it contains not less, probably, than six or seven million gallons of waste from the woolen mills, dye and print works, bleacheries, soap works, jewelry manufacturies, etc., etc., which form an exceedingly dark mass, changeable in color and strongly alkaline.

From the intercepting sewers, the sewage is collected and after being freed from its solid matter is pumped to the plant, a distance of 2,000 feet, through an 88-inch conduit.

The chemical precipitation plant consists of twenty concrete tanks, four large or roughing tanks about one hundred feet square, and sixteen smaller ones, called finishing tanks, sixty by one hundred and sixteen feet, with five sludge reservoirs, press house, chemical building and a laboratory and office building. All these are fairly well shown in one of the accompanying views.

Eighteen of the tanks are contained in a rectangular area, two hundred and seventy by six hundred and seventy feet, with two roughing tanks extending to one side, the whole covering an area of 5.03 acres, with a cubic capacity of 11,133,421 gallons.

The 88-inch conduit empties into the mixing channel, which is one hundred and fifty feet long and sixteen feet wide. This channel also connects with the laboratory, from which is discharged into it the chemical ingredients employed in the purification of the sewage. In order to prevent a direct current through the channel, baffle plates, six feet apart on alternating sides, and lapping each other by twelve inches, are placed. By the time the sewage and chemicals reach the other end of this tank, the two are thoroughly mixed and so they pass into the roughing tanks. These are so arranged that the effluent from any given roughing tank can be conveyed to any finishing tank through a central channel running lengthwise of the group of tanks.

The inlet into the finishing tank is regulated by a gate and a weir across the end of the tank, the out-fall being over a weir which extends the whole width of the tanks, thus securing an even and steady flow through the tank. When a tank is to be cleaned, the clear effluent is drawn off through a floating weir into channels constructed in masonry walls, and the sludge is discharged through open channels in the corridors, arranged so that the whole length can be inspected and cleaned.

### The Disposal of the Sludge

The sludge is brought to a sludge well, situated close to the press house, from which it flows into the Shone ejectors, situated in a wall inside of the house. The ejectors (two of 500 gallons capacity each) raise the sludge about fifty feet into reservoirs back of the building, whence it flows to the forcing reservoirs, steel tanks twelve feet long by eight feet in diameter, to which compressed air of from sixty to eighty pounds pressure is applied, and the sludge forced into the presses. The effluent is sent back through the tanks again, and the sludge is carried away in steel cars, drawn by a small steam locomotive, to the dump.

The chemicals employed are lime and sulphate of iron. The pressed sludge is now being used for filling, although the works are so constructed that the wet sludge can be discharged from the sludge reservoirs into barges, or other vessels, and taken out to sea.

The pumping and pressing is done by compressed air, for which purpose two Rand air compressors are used. These compressors are driven by electric motors, one of fifty, and the other of one hundred and fifty nominal horse power. Electricity for power and lighting the works is furnished by the local electric light plant. The presses were made by John Johnson & Company, of New York, and are of the regular English type, with three feet square plates, making three-quarters of an inch cake.

The total cost of the precipitation plant, including everything except the original cost of the land, amounted to $309,155.60, and the plant has been operated long enough to determine that the cost for maintenance will be considerably below the original estimated cost.

### Emergencies Provided for

In the original design of the plant, an effort was made to provide for every emergency. For instance, in case of storms, the sewage, wholly or any part, can be turned down a stepped fall into the effluent out-fall sewer, and allowed to flow directly to the river, without treatment in the tanks. This precaution prevents any crippling of the plant by an over-supply of storm sewage.

In the continuous flow treatment, it has been found advantageous to have the sewage enter and leave the tanks without causing an increase in current in the main body of the liquid, precipitation being more complete when an even and more nearly quiescent flow is maintained. With the arrangement of influent and effluent weirs adopted, this desirable result is most nearly attained. An additional benefit derived from the long outflow of weirs is the aerating effect obtained by bringing so large a portion of the thin effluent streams in contact with the air.

The city of Providence has solved, satisfactorily, its problem of sewage purification. It is to be commended for setting so worthy an example. It is an example which could be profitably followed by most of the cities in the United States. There are many municipalities which, long ago, should have taken steps toward the purification of their sewage waste for the benefit of their neighbors if not for themselves. A few states have already passed laws which, if consistently enforced, will gradually correct this evil, and it is hoped that the day is not far distant when a federal law will be passed by Congress, providing for a national safeguard, and so compelling the states to act in harmony upon this most important question.

# SEWAGE DISPOSAL*

## The Views of an Expert—The Problem Stated—The Practice in Foreign Cities—The Best Methods Employed in the United States

*By Rudolph Hering*

To remove misunderstandings as to the character of the material we are dealing with, it should be stated that the average city sewage consists of about one part of decomposable organic matter, and about one part of mineral matter dissolved or suspended in 1,000 parts of water. This one part of organic matter, however, after decomposition, is sufficient not only to discolor the water but to permit offensive putrefaction. Fresh sewage does not differ much in color and odor from the water leaving kitchen sinks or laundry tubs. But after flowing in a sewer for hours—particularly if such suspended matter has been retained by its rough walls, or dissolved matter has been retained by eddies—sewage first emits a stale, and then a strong putrid odor. The mineral matter is introduced into the sewage chiefly by the rain water flowing over the surface of the streets. With this mineral matter is carried down some of the organic matter which by decomposition further adds to the offensiveness.

For these reasons every effort should be made to prevent retention of any solid matter, by providing for a good and constant velocity of the water and by giving the interior perimeter of the sewers as smooth a surface as practicable.

When reaching the outfalls in large cities the sewage is, nevertheless, already somewhat foul and putrid, but in works that are carefully designed and built and faithfully operated the offensiveness can be reduced and kept to an unobjectionable minimum.

Approaching now the question of sewage disposal, it must first be stated that the best manner of such disposal depends entirely upon what is done with the sewage after it has received treatment; several methods are available, depending chiefly upon local conditions, the most important of which are:

1. Dilution in large bodies of running water.
2. Intermittent filtration through sand.
3. Chemical precipitation.
4. Partial liquefaction in septic tanks, followed by high rate filters of coarse material and liberal aeration.

Every system of disposal should have for its object to render harmless the bacteria of disease contained in the sewage, and to prevent offensiveness on land or in water courses. It will be further necessary to ascertain for each locality the expense of the most available treatments, and select that one which will satisfy the local conditions at the least cost.

A brief description in outline, covering the essential features and best practice regarding each one of these four methods is as follows:

### First Dilution

When any water supply cannot be injured by the introduction of sewage into a large stream of running water, it is the common custom to dispose of sewage in this manner, because it is generally the most economical method.

The disposal by dilution is therefore subject chiefly to the requirement that the water course does not become offensive in the channel or at the shores at any time.

To secure this result, it is necessary to ascertain what the least pollution would be to guarantee such a condition. Experience in Europe and America has established certain general standards in this respect. No specific rules can be set down which are applicable to all cases. It is necessary to consider a large number of conditions, all of which have a bearing upon the subject. Nevertheless, it is practicable to state certain general limitations.

As a unit of measure for a proper dilution, it has become customary to take the amount of flowing water which is required for the sewage of 1,000 persons, after this has become thoroughly dispersed throughout the water section. The Chicago Drainage Canal, which was built to dilute inoffensively the sewage of Chicago, is proportioned so that a minimum flow of three and one-third cubic feet of water will be supplied per thousand persons. In other cases a much greater dilution is necessary. The usual limits are a minimum of two and one-half and a maximum of seven cubic feet per second, per thousand persons, depending on the character of the water, the addition of manufacturing refuse, the existence of mill ponds or lakes, and upon whether the stream is tidal or not, whether the average temperature is high or low, and whether the water of a stream has a natural aeration or not.

### Second, Intermittent Filtration Through Sand

Of all the processes for sewage purification, none equals in effectiveness the slow percolation of sewage through porous soil or sand. It is Nature's method of purifying the dirty water which, after a rain storm, flows over the surface of the ground, gathering dust and bacteria, then slowly descends through the pores to the spring level and finally issues as a pure and limpid spring water.

For more than a century this process of purification has been employed, but not until recently has the process been understood so as to apply it intelligently under all cases. It is now possible, with a given quality of sand, a known diameter of its grains, and the proper construction of the filter beds, to foretell within narrow limits, how much sewage of a given composition can be purified on an acre of ground, and what degree of purification will result during summer and winter seasons.

Generally speaking, an acre of good, effective sand can be arranged to purify indefinitely the sewage of from 1,000 to 1,500 persons. If the sand is coarse and deep, or, if some of the suspended matter in the sewage can be previously removed by sedimentation or otherwise, a still greater amount of sewage can be treated. If the sand is fine and

* This article is a part of the paper read by Mr. Rudolph Hering, Consulting Engineer, of New York, before the seventh annual meeting of the League of American Municipalities, held at Baltimore, October 7th, 8th and 9th. The subject of his paper was, "Garbage and Sewage Disposal."—[Editor.

mixed with loam, the amount, on the other hand, is correspondingly reduced.

The other chief requirements of a filtration field are a level surface and a sufficient number of discharge outlets for the sewage, so that it can spread evenly over the surface and establish a nearly uniform percolation through the sand at all parts. The usual depth of sand varies from four to six feet. In order to allow of a ready removal of the filtered water, it is necessary to sub-drain the field with ordinary tiles.

The sewage must be applied intermittently, perhaps two, three or four times a week, in order to allow it to descend into the sand and between applications to be followed by air, which is necessary to produce the oxidation of the organic matter of the sewage, by the aid of myriads of bacteria contained in the sewage itself and by which its purification is accomplished.

Filters of this description have been operated successfully for many ears, and unless they are over-dosed, they can continue in operation indefinitely. The only necessary work to be done in maintaining them is a frequent raking of the surfaces to remove the dried scum and to freshen the surface. In case of high dosing, it is necessary to give the fields a longer rest than a couple of days, so as to allow a better oxidation of the organic matter accumulated within the pores of the deeper layers of sand.

The best cases of intermittent sewage filtration in our country can be found in New England.

### Third, Chemical Precipitation

This is a process extensively used, chiefly in England, under conditions where sand was not available for filtration. There are but a few examples in the United States, the two largest being in Worcester, Mass., and in Providence, R. I. It consists of the treatment of raw sewage with chemicals, like lime, alum or copperas, and the discharge of the treated sewage through tanks holding several hours' flow, in which most of the suspended matter is precipitated. A thick mud called sludge accumulates at the bottom and requires subsequent removal and a special disposal.

By this process it is not practicable to remove more than about one-half of the total organic matter, and the cost often makes it quite expensive for the amount of purification obtained. Where the effluent water can either be highly diluted in a flowing stream or large body of water, or receive further treatment by filtration on land, this process, if economical, may answer the desired purpose.

### Fourth, Septic Tank Treatment

During recent years, much has been written and done concerning a process which appeared to accomplish sewage purification at a less expense than chemical precipitation. It combines the results of subsidence and of the bacterial processes, by detaining the suspended matter in a tank sufficiently long to allow a large proportion of it to be liquefied by bacteria which greatly reduces the original bulk of the sludge and therefore the trouble and expense of removing and disposing of it.

The tanks should hold from one-half to one day's flow, so as to induce the necessary putrefaction. It may be said that, roughly, one-third of the suspended matter of sewage is mineral matter, chiefly from street washings which gradually accumulate in the first tank and must be removed from time to time; another one-third is liquefied and gasified, and the remaining one-third leaves the tanks together with the overflowing liquid.

The chief effect of this septic treatment is to reduce the amount of suspended matter, but not to completely purify the liquid and solid sewage matter. Here, as with chemical precipitation, it is necessary to have a subsequent treatment to obtain such purification, and this can be done either by dilution or by filtration through sand or through coarse grained material.

As the amount of the suspended matter in the septic tank effluent is much less than in raw sewage, a subsequent purification by intermittent filtration can be accomplished at very much higher rates than with the ordinary sewage, perhaps up to ten times the rate. Where sand is readily available, coarse filters or so-called contact beds may be constructed. These beds are filled to a depth of three to five feet with coarse material ranging from one-quarter to one-half inch or more in size. By filling them so that the septic tank effluent can remain for several hours before draining out, and by allowing the tank between fillings to be aerated, it is possible to treat the septic effluent at rates of 500,000 to 1,000,000 gallons per acre per day. The water issuing from these coarse grained filters is not generally as pure as that issuing from intermittent sand filters, but it is generally sufficiently stable so that it does not undergo further putrefaction.

Where freezing temperature is of short duration, or where it never freezes, a septic tank effluent can, according to the most recent experiences, be most economically purified in the form of spray like rain falling over the surface of a bed made of layers of broken stone or coke, the particles being of larger size than those above mentioned. If the conditions are favorable for its operation, this process is less expensive and secures a better effluent than the ordinary contact beds.

As the septic tank effluent generally contains no oxygen compounds but hydrogen compounds instead, it is desirable to give it, if practicable, a liberal aeration before it is passed onto the filters, because the final purification takes place chiefly in the presence of oxygen and would be retarded by hydrogen compounds.

Briefly reviewing the subject of sewage disposal it can be said that the methods of dilution and intermittent filtration through sand are those most used, most effective, and where, practicable, also most economical. If the conditions are such that neither method can be adopted, then a preliminary treatment by the septic process followed by passing the effluent through some form of rapid filter, appears to-day to give an economical, and, with due care in design and operation, also a fairly satisfactory result.

## WATER SUPPLY OF MOBILE

The citizens of the city of Mobile, Ala., are supplied with water from both the city and a private plant. The municipal water works system is a modern plant in every respect, having cost in the neighborhood of $800,000. It supplies 6,054 taps, and about 100 taps per month are being added to its lines. The water supply is of the best, and the effect of this on the health of the city has been most marked. This is especially evident in the colored section, known as "the gas works district." The daily consumption there is large, but the results justify the large amount of water used. The city system supplies 650 fire hydrants and saves about $14,000 per year, which amount was charged by the private company for 200 fire hydrants. The income of the plant is about $28,000, and is showing a steady increase since Mr. C. W. Soost was placed in charge last March. The usual objection to water meters has been met with, but the meter rate is the cheapest, being 8 cents per thousand gallons where the consumption is over 100,000 gallons per month. Where meters are not placed a flat rate of $6 per year is charged for a three room house, with 50 cents per year additional for each room up to ten.

The private company is known as the Bienville Water Supply Company, and has been in operation for a number of years. The water supply is of good quality, and there are in operation 1,600 taps. The company has been cutting rates recently in its competition with the city plant, prices being nearly one-half of those charged by the municipal water system. Consumers who pay six months in advance are given free service for six months. Efforts have been made by the city to purchase the plant of the company, and the board of appraisers reported on its value. It is expected that the city will ask for legislative powers to make the purchase, and that the matter will be submitted to a vote of the people.

# SPRINGFIELD'S WATER SUPPLY

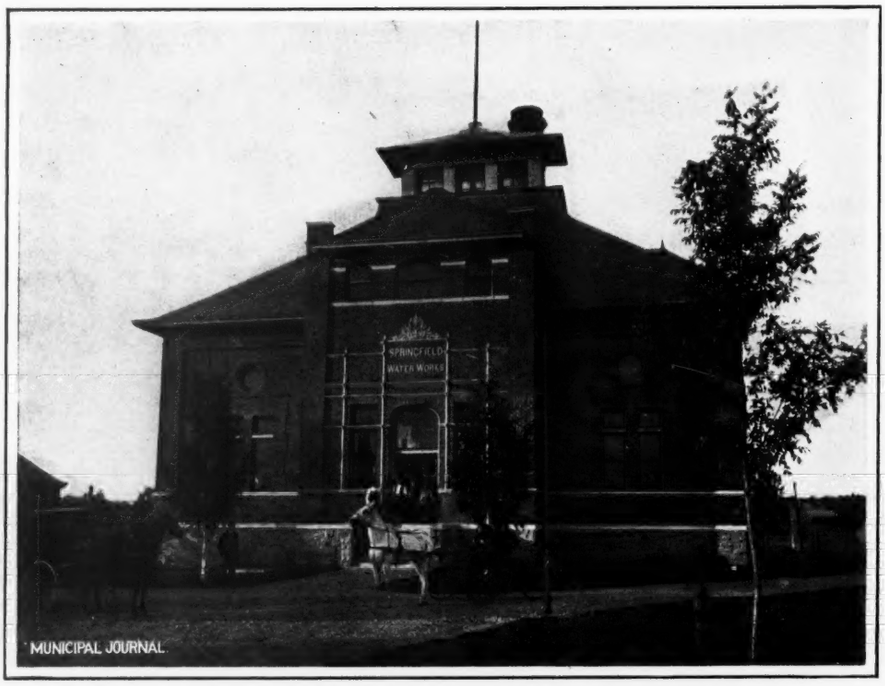
## How an Ohio City Has Solved a Difficult Problem—A Natural Water Filter—Results Satisfactory After Repeated Experiments

*By L. Walter Harrison**

Springfield, Ohio, has at last solved the question of a water supply. That there is no excellence without great labor has been truly demonstrated in what has proved an eminently successful solution of this problem which is perplexing all cities, and it might be added in Springfield's case that great expense as well as great labor has entered materially into the question.

### Water Supply Filtered by Nature

It goes without saying that the water supply system of which Springfield boasts to-day stands without precedent in any city of the United States. This is not to say that other cities do not enjoy a supply of water equal in resource or quality, but it is to say that the system of itself is so simple, yet so unique, as to commend itself for consideration. Briefly, Springfield now gets all her water from a creek which from time immemorial has poured its limpid waters down through the great Miami valley, finding its source in the crystal springs of the hills and encountering no contaminating influences save that found in contact with the farm lands of the greatest agricultural region in the world. By artificial means this water, pure, sweet and safe to drink, barring the always immediate possibility of temporary contamination, is now filtered through a natural bed of gravel twelve acres in area where, at a depth of twenty feet, great drains lead to the well at the pumping station. The practical test has been made and the influence of a 21-inch stream of water turned out into this great natural filter, was felt within twelve hours to the extent that the water in the well, thirty feet in diameter, raised three feet in nine hours with the engines pumping at the rate of five million gallons per day.




THE PUMPING STATION

The process has been a simple one, yet, the materialization has come only after the absolute failure of an expensive experiment, by accident, dovetailed perfectly into the last resort available, and, to make the system as it stands complete to-day, understood, it becomes necessary to begin at the beginning.

### Failure of Former Source of Supply

Springfield inaugurated her original waterworks system using surface water. That is to say, the water which the city has used on her streets, at her fires and in her houses until the past two years was drawn from a great bed of gravel unlimited practically in extent, the same which now constitutes the filter. The constant dripping of water wears away a stone and the constant and increasing drain upon a reservoir which it had taken years to fill, exhausted it and after four or five years it became necessary to move further up the valley. This was decided upon, and the illustration shows what is known as the new pumping station located right in the middle of the immense gravel bed which, at the time the house was built and the well excavated, was pregnant with water. History repeats itself, and one fine morning the engineer at the pumping station with horror noted that his engines were taking air, and a hasty examination showed less than two feet of water in a well which should have contained fifteen. Reluctantly the board of trustees controlling this department of the city's utilities, realized that their system had failed and hastened to meet the immediate emergency.

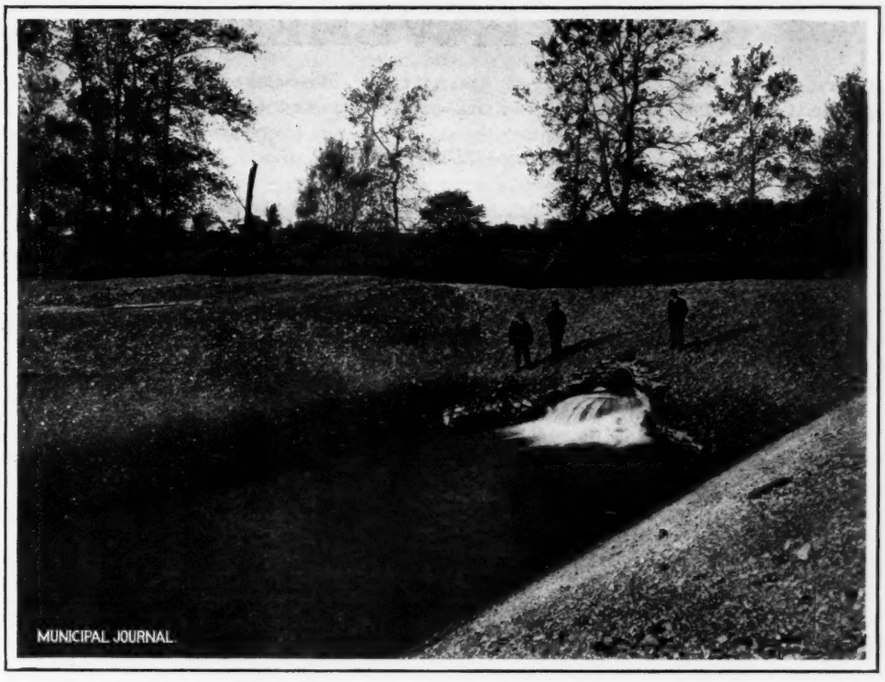
### The Only Source of Supply Preempted by Water Power Privileges

Buck Creek, historic in that its waters furnished the power which laid the nucleus of one of the greatest manufacturing cities in the world of its size, offered temporary relief, but there was an obstacle. Water rights, the most zealously guarded by law of any privileges known, were owned by prominent citizens, and this water, which was needed to supply fire protection and domestic demand, belonged to private individuals who threatened injunction proceedings were a move made to appropriate it. Not to be outwitted, the trustees worked silently and in the night, connecting the creek with the well direct and, to the joy of all one morning, they announced that immediate danger was over. Yet there remained this omnipresent phantom of contamination which had to be overcome, and brains set to work to remove the obstacle. After due consideration it was decided to penetrate this immense gravel reservoir with mains and laterals at a depth of twenty feet, leading thousands of feet up the valley, and the system has been installed during the past two years at a cost of approximately $50,000. In this process two farms were purchased, and in this manner the city came into perpetual possession of what is believed to be one of the greatest available natural filters in the country. To the disappointment and chagrin of the authorities it was found that the reservoir thus tapped had already been drained beyond its usefulness and confronting this last expenditure of $50,000, for which bonds had been issued, there was yet no water and direct connection with the creek was again resorted to.

* Managing editor *The Sun*, Springfield, O.

THE PROBLEM SOLVED

It was at this time that the new Board of Public Service, as required under Ohio's new municipal code, was elected, and the members had hardly filed their bonds before they were burdened with the responsibility of solving a problem which had staggered their predecessors. Bernard Higgins, a plumber and former superintendent of the water works department and a member of the new board, set his brains to work. He conceived the idea of damming the creek at the upper line of the gravel bed, and by means of surface laterals and mains, which we will, for convenience sake, call distributing laterals, accomplishing the desired result. He believed that a large stream of water taken from the creek and distributed over twelve acres of gravel to filter down through fifteen feet of gravel, there to find the laterals and mains leading back to the well, would solve the question. He secured the approval of his colleagues, and, with the assistance of the city engineer, went to work. A small reservoir, for the settling of sediment, was excavated near the banks of the creek and connected with the stream by a 21-inch pipe. The illustration shows the water pouring into this reservoir. When the water rises in this reservoir to a height of six feet it finds its outlet into the distributing laterals and at once begins to spread and percolate down through the natural filter. The test was made. It worked so perfectly that, as has been said, in nine hours the water in the well rose three feet against engines pumping five million gallons per day. Every drop of water that Springfield uses stands analysis as it comes from the creek. Every drop must filter through fifteen feet of gravel before reaching the well. The supply is inexhaustible and the system, a combination of Nature and man's handiwork, is the most unique yet the most satisfactory imaginable.




RESERVOIR WITH SUPPLY LINE FROM CREEK

# MOBILE ENGINEER REPORTS ON WOOD PAVEMENTS

IN reporting to the Board of Public Works of Mobile, Ala., after attending the convention of the American Society of Municipal Improvements, City Engineer D. N. Hazelhurst said in part: "On October 20 to 23 last, acting under your direction, I visited Indianapolis for the purpose of inspecting and reporting on the pavements there and then had an opportunity to discuss these matters with the President of the Board of Public Works, the City Engineer and other officials, contractors and interested individuals.

"Including the contracts now under construction, Indianapolis has 350,205 square yards of wooden block pavement, in length, 17.31 miles, of which 236,760 square yards is creosoted. Some of this work has been in service since 1895.

* * * * * * * *

"While it is problematical whether the addition of the oil adds anything in itself to the strength of the wood fibre, nevertheless the effect of the treatment as compared with untreated material is very remarkable, an instance of which is shown in an article concerning the flooring of the Rush street bridge in Chicago, appearing in the *Engineering Record* of March 28, 1903, as follows:

"'The wood paving block on the Rush street bridge, Chicago, offers a striking comparison of the wearing qualities of untreated blocks and those creosoted. In the fall of 1899, one of the two driveways of this bridge was paved with creosoted blocks and the other with Norway pine blocks. It had been the intention to pave both sides with the creosoted pavement, but this was not done on accout of the delay in obtaining the materials and the demands of the public for the immediate use of the bridge.

"'The bridge carries an extremely heavy traffic of great volume—greater, according to Mr. F. F. Quility, assistant engineer in the department of public works, than any other bridge in the city. Each of the roadways is eighteen feet wide, and the following number of vehicles was observed to pass over them between 7 A. M. and 12 midnight on December 19, 1902: Heavy trucks, drays, etc., 3,598; light vehicles, 3,275; carriages, buggies, etc., 2,078; automobiles, 165, making a total of 9,116 vehicles in seventeen hours. This, it is stated, may be assumed to be the normal traffic carried by the bridge. In December of last year, it became necessary to replace the paving on the side laid with the untreated Norway pine blocks on account of its bad condition, the five-inch blocks being in some cases worn through to the sub-planking. At the same time some of the creosoted blocks were removed for inspection, and they were found to have worn on an average one-eighth of an inch per year, and were sound, unbroken, true to their original shape, and in general gave no evidence of deterioration other than the wear noted above."

"In an inspection of the Indianapolis pavements, desiring to find that the wear had been under ordinary traffic, I removed a creosoted block from the crown of a roadway in a manufacturing district and after five years of service. The loss was one-eighth of an inch, and was entirely uniform over the entire street so far as could be observed, there being no unequal spots, nor individual blocks which were worn more than those adjacent. It was particularly noticeable that the streets were generally in the best condition, and presented a smoother surface where traffic was heaviest.

"In conclusion, I was most favorably impressed with the wooden block pavements as seen in Indianapolis, their advantage being their cleanliness; the absence from dust; their noiselessness, the ease of traction, the simplicity of repair, and their durability. The cost of this pavement in Indianapolis is considerably greater than asphalt, but it is the favorite construction both by the municipal authorities and the general public. Owing to the proximity to the untreated material, it is believed that the price of this pavement in Mobile, and providing for the treatment indicated as likely to produce the best results, will not exceed the cost of asphalt, and can be laid under similar guarantees as to durability."

# BRICK PAVEMENTS*

## Brief Description of Their Origin and Qualities—Hardness, Toughness and Strength —Homogeneity and Uniformity—Imperviousness to Moisture and Density

*By George W. Tillson, C. E.*

### Foundation

The foundation of a brick pavement, like that of all others, is very important. As has been shown before, blocks of any kind wearing from abrasion wear much more rapidly if they are not exactly level. Thus, if the blocks are set and maintained with a smooth, even surface, so that the wear is directly on the top rather than on the edges or corners, the abrasion is reduced to a minimum and the life of the pavement correspondingly increased. This is particularly important in a brick pavement, because the blocks are necessarily small and the number of joints and corners correspondingly increased, so that to get the best results the foundation should be such as will allow the brick to be placed in position and so maintained under traffic. Unfortunately for the good name of brick pavements this principle, if understood, has not always been carried out in practice.

Brick pavements have been laid upon foundations of sand alone, a combination of boards and sand, a combination of sand and bricks laid flat, and on a foundation of broken stone and cement concrete.

For reasons specified above, it can readily be understood that a foundation of sand alone cannot be expected to give good results. The weight of a vehicle coming upon any particular brick is transferred to the foundation beneath, and if the foundation be sand, and the underlying earth unstable, any amount of heavy traffic is bound to make such pavement soon appear rough and uneven. The wear then quickly becomes abnormal, and the pavement wears out and is replaced long before it should have been. The early pavements in some places were laid on a foundation of 3 inches of sand, upon which were placed oak boards 1¼ inches thick which had been previously soaked in coal-tar, and this covered with a cushion-coat of 1 inch or 1½ inches of sand. This foundation gave very good results for light traffic, but could not be expected to sustain the heavy travel of business streets.

Another method adopted was laying the bricks flatwise on a bed of sand, rolling and ramming them thoroughly. They were then covered with a cushion-coat of sand, and the surface brick set on edge. This construction has been used to considerable extent in the Central West and with good results. It commends itself to cities located at any distance from stone-quarries, for two reasons: The stone necessary for this foundation, whether used with or without cement, is expensive, and because it gives an opportunity for the economical use of the underburned brick, which are not suitable for the wearing surface, but have been burned sufficiently to give satisfaction in the lower course. It can be seen that in a locality where brick are readily available and the cost of freight is correspondingly low, and where broken stone is expensive, this would be an economical foundation; but if the brick are to be carried to such a distance that freight is an important item, it might prove to be expensive. The proper plan must be determined upon in each case.

### Broken Stone

In many parts of Illinois where paving-brick have been used to a considerable extent, limestone can be obtained easily and cheaply. Consequently foundations of broken stone, thoroughly rolled and compacted, have been used in many cities with excellent results. With this material, however, care must be taken to roll and compact the stone thoroughly to a hard, firm surface, so that when the cushion-coat of sand is applied and the pavement laid, the traffic will not cause the sand to mix with the stone in the foundation, thus causing a settlement in the pavement and allowing it to become rough and uneven. Several brick pavements have failed from this cause. If, however, the stone be rolled as for a macadam road, and thoroughly compacted and made solid, it cannot fail to give good satisfaction if undisturbed.

### Cement Concrete

The best foundation, although its expense in every case may not be justifiable, is cement concrete, such as has been heretofore described. It should be made in the same manner as for asphalt or stone, but care should be taken to have the surface as smooth as possible, so that there will be no danger of any brick resting upon a projecting piece of stone and so getting an unequal bearing, and perhaps breaking under a heavy load. The object of the sand cushion is simply to give the brick a firm bearing, and the smoother the surface of the concrete the smaller the quantity of sand necessary, and the smaller the quantity of sand the less liable is any individual brick to settle out of place.

### Joint-Filling

The material for filling the joints of the brick pavement is practically the same as that used for stone, with the exception of gravel combined with tar. All have been used in different sections of the country, but it is not yet a settled fact which is the best. The City Engineer of Minneapolis in his report for 1898 states that when, during the year, the city asked for bids from manufacturers for furnishing paving-brick, with a guarantee of fifteen years, allowing the bidders to designate the filler which they preferred should be used, one bidder specified sand, and distinctly stated that unless it were used he would not guarantee his brick. It is generally considered, however, that when brick are laid on a solid foundation, a rigid, or at least water-tight, joint-filler should be used. Of these, the three principal ones are Portland-cement grout, Murphy grout, and paving-cement. Engineers, however, do not agree as to which one of these gives the best results. The two former are rigid, and when the joints are once broken they can never be made tight, and are no better than a sand joint, while a pitch joint once broken will become solid again at a warmer temperature.

At a meeting of the American Society of Municipal Improvements, held in Toronto in 1899, it was stated by one engineer, in a discussion upon this subject, that he had examined nearly all of the brick pavements laid in this country with a Portland-cement joint, and had come to the conclusion that they were failures. Further on in the discussion another engineer of equal experience stated that it was his belief that a brick pavement well laid with a Portland-cement joint would last five years longer than a similar pavement laid with sand joints. This testimony was corroborated by that of another engineer of considerable experience. The principal objection that is made to the use of the cement-grout joint is on account of the rumbling noise that is heard when driving over such a pavement. This does not always happen, but has occurred in a great many instances and is certainly very objectionable. The rumbling must be caused by cavities that exist between the brick and the concrete. Just what causes these cavities is not so well known.

In discussing this subject in a convention of the National Brick Manufacturers' Association, held in Pittsburg in 1898, it was thought by many of the manufacturers that these cavities were caused by a slight shrinkage of the concrete, and their remedy was not to have the brick laid until the cement had become thoroughly set and dry. Other people, and perhaps those who have studied the question more, think it is caused by expansion; that the curbstones acting as abutments support the arched pavement, and that it expands with the heat and rises from the concrete. To

* This is the last of a series of four articles on "Brick Pavements," by Mr. George W. Tillson, Chief Engineer of the Borough of Brooklyn. It is a reprint of the chapter on that subject from his valuable work on "Street Pavements and Paving Materials," published by John Wiley & Sons, New York. The complete work has 532 pages, octavo in size, bound in cloth, and sells for $4.00. *Copyright, 1900, by George W. Tillson.*—[Editor.

obviate this it was recommended that an expansion-joint of 1 inch or 1½ inches be left next the curb and filled with asphalt or paving-cement; also to lay expansion-joints filled with the same material across the street at regular intervals. It would seem, however, that if this trouble was caused by expansion, it would have taken place longitudinally along the street, as the width of the street is slight as compared to its length. This has occurred in one or two instances. It is reported that at Easton, Pa., when the temperature was 94° in the shade, a brick pavement was heaved to such an extent that it broke with a loud noise. The rupture formed an arch with a nine-foot span and an eight-inch rise extending from curb to curb, a distance of 42 feet.

An occurrence somewhat similar to this took place in Newark, N. J. Very few instances, however, have been reported, and in Brooklyn, N. Y., there is one street laid continuously with brick with a Portland-cement joint, a distance of ½ mile, where no trouble of this kind has occurred.

In 1895, however, two blocks of brick pavement were laid with the Mack block and Portland-cement joint. After the bricks were laid and had been rolled, the weather turned so cold that it was impossible for a while to do the grouting. When the weather became warmer, in attempting to roll further, it was found that the bricks were so solidly imbedded in the frozen sand that many of them broke under the roller and the rolling was discontinued. An attempt was made to thaw out the frozen sand with hot water, but how thoroughly it was accomplished is uncertain. After the pavement had been laid for some time, a great deal of rumbling was observed when teams were driving over it, and many complaints were made by property owners. The bricks were cut out for a distance of 1½ inches along the curb on both sides, to see if that would relieve it, but no difference was noticed. A fifteen-ton macadam roller was run continuously over one block during an entire day in an attempt to press the brick down to a firm bearing. This caused no impression whatever upon the pavement, and the noise still continued as loud as before. So many and persistent were the complaints that the brick was finally taken up and replaced with asphalt. The other block, however, was not quite so noisy and is still in use, and no complaints are made by the property owners, and it seems as if the noise had decreased.

The theory of the city authorities was that there were slight local cavities existing between the brick and the concrete, caused by the frozen sand melting and shrinking somewhat. It is probable that an air-space of ⅛ of an inch, and perhaps even less than that, would cause this rumbling, and it would seem in this case as if the above were the proper solution. The argument against the expansion theory is that in many cases the noise is reported to have been greater during cold weather than warm.

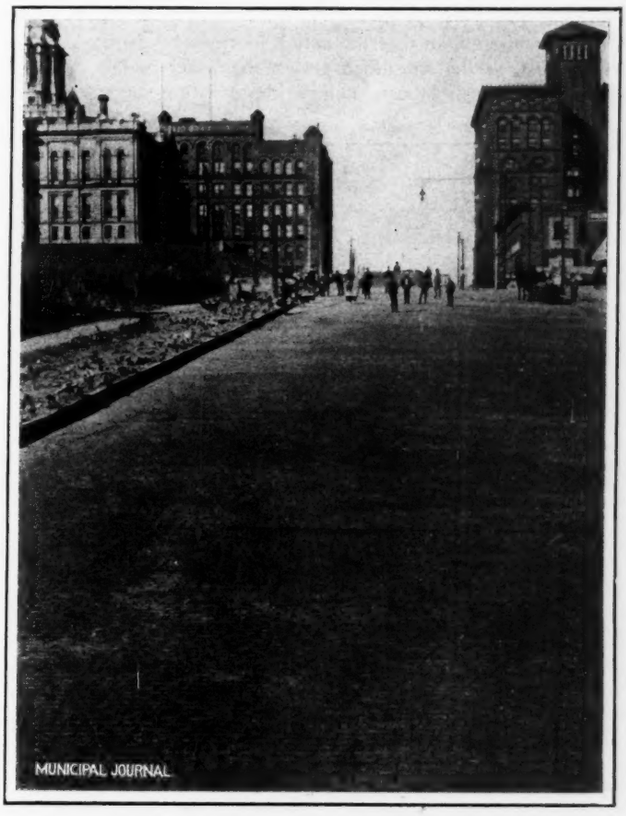
There seems to be no question but that a brick pavement with its joints filled with a good cement grout will last materially longer than one with a less rigid filler, and if the pavement is laid during warm weather and care is taken to have the bricks thoroughly rolled and bedded in sand, there should be no trouble from abnormal noise. No trouble from noise has ever been experienced when sand or paving-cement has been used as a filler. If the foundation is not solid and is liable to settle unevenly, it would be a waste of money to use a rigid filler.

One objection to the rigid joint is the difficulty with which cuts are made in the pavement. Many bricks are broken in taking them up, and the expense of cleaning before relaying is considerable. It is also hard to keep traffic off a small patch while the cement is setting.

A very large proportion of the brick pavements in the West have been laid entirely with sand joints, and experience there has shown that good brick will wear well under such conditions, but the pavement will not be impervious to water. When that is required a solid filler must be used; and if the engineers are afraid of noise from Portland-cement, a paving-cement filler can be used to advantage. If sand is used, it should be fine, silicious, and perfectly dry, so that it can be swept readily into the joints, so as to fill them completely and thus maintain the bricks in the position in which they are placed.

The paving-cement should be applied at a temperature of from 250° to 300°, and if possible during the warm portion of the day when the bricks themselves are warm, so as to allow the cement to flow readily and completely fill the joints. This filling is sometimes applied by pouring the cement directly into the joints from buckets made for that purpose, or by spreading it indiscriminately over the surface and sweeping it into the joints with brooms. The objection to this latter method is that a certain amount of the cement is wasted and the entire surface of the pavement covered, which is liable to be sticky during the hottest part of the day. To obviate this last trouble, as soon as the joints are filled the pavement should be covered with a thin coating of sand, which under traffic will take up the cement and clean the surface to a certain extent. If the first covering should not do this satisfactorily, a second can be applied. This will also probably be necessary if the joints are filled from the buckets.

The grout, when Portland cement is used, is made by mixing equal parts of Portland cement and fine, sharp sand with sufficient water to give it such a consistency that it will readily flow into all the joints. Great care is necessary in this mixing both of the cement and sand, and also when the water is added, so that the




BRICK PAVEMENT MADE WITH PURINGTON NO. 1 BLOCK AND GROUTED WITH PORTLAND CEMENT—OMAHA, NEB.

grout shall be uniform in quality and not leave one joint in the bricks filled with almost pure cement and another with almost clear sand. The grout is generally mixed in large boxes, taking one barrel of cement at a time, and, after being thoroughly mixed, poured out upon the pavement and thoroughly broomed into the joints. The street should be closed to traffic until the mortar of the joints is absolutely and entirely set, which will probably require a week and perhaps more; but it is very important that it be thoroughly hardened before any traffic is allowed upon it.

### Laying the Brick

After the concrete has become sufficiently set it should be covered with a sand cushion, care being taken to see that the sand is entirely free from any small stones or pebbles that might cause the brick to be supported unequally. The sand is brought to the

exact shape desired by means of a template which has been cut to the required crown, resting on the curbs if the roadway be narrow, or, if too wide for that method, with one end resting on the curb and the other on a scantling buried in the sand at the centre. After one side is brought to the desired shape, the template can be reversed and used on the other side. No walking on the prepared surface, or disturbance of it of any kind, should be allowed The pavers, unlike stone-pavers, should stand on the completed pavement, working from themselves. The courses should always be started with a half-brick, so as to break the joints evenly across the street, and when finished they should be set up tightly with an iron bar so that the end joint shall be as close as possible.

This is important, whatever the joint-filler is, as these cross-joints come directly in the line of travel. The courses should be kept square with the street and trued up every four or five feet. It is customary generally to have one man working at the side of a street where the courses are completed, cutting the brick to be used as closers. After the brick have been laid, the surface should be swept off clean and, if a steam roller is to be had, should be thoroughly rolled until all the brick are brought to a firm and even bearing. If the brick run unevenly for hardness, it may be desirable, just previous to rolling, to wet the pavement thoroughly with a hand-hose, so that the soft bricks can be detected. This is a sure test, as the soft brick absorb the water readily, and when the harder ones dry those retaining the moisture can easily be seen

SHOWING SPLENDID WEARING QUALITIES OF BRICK PAVEMENTS*

and should be removed and others put in their places.

If a steam-roller cannot be had, good results can be obtained by ramming, when a plank should be laid on the surface parallel to the curb-lines, and the pavement rammed by striking the plank with an iron rammer. If the planking is used crosswise of the street, the pavement is liable to be rammed unevenly. The principles laid down in the stone pavement for the position of the bricks and direction of the courses, both between streets and at intersections, are perfectly applicable to brick. The method shown in Fig. 57, called the herring-bone plan, is sometimes used. This, however, is not desirable, as between the streets it brings the line of cross-joints lengthwise to the travel of the street, which permits a weak spot in the pavement, and at intersections it brings a great many of the brick lengthwise of the traffic turning the corners. This method has never been used to any great extent. Brick pavements, especially when laid with a sand filler, generally show considerable wear during the first few weeks, especially if laid with rectangular bricks rather than those with rounded edges. This is because the traffic quickly finds any inequalities in the surface, and also because the horses' shoes soon round off the edges of the softer brick; but in a short time this abnormal wear ceases, and from then on the observable wear is slight.

Brick specifications vary principally in the tests that shall be required, joint-filling, and foundations. The following is taken from the specifications of St. Louis:

"To secure uniformity in bricks of approved manufacture, delivered for use, the following tests shall be made:

"1. They shall show a modulus of rupture in cross-breaking of not less than twenty-five hundred pounds per square inch.

"2. Specimen bricks shall be placed in the machine known as a 'rattler,' twenty-eight inches in diameter, making thirty revolutions per minute. The number of revolutions for a standard test shall be eighteen hundred, and if the loss of weight by abrasion or impact during such test shall exceed thirty per cent. of the original weight of the bricks tested, then the bricks shall be rejected. An official test to be the average of two of the above tests.

"No bid contemplating the use of rejected brick shall be entertained.

"Samples may be submitted by manufacturers, in which case the bidder proposing to use brick of such manufacture will not be required to submit samples. The quality of brick furnished must conform to the samples presented by the manufacturers and kept in the office of the Street Commissioner.

"The Street Commissioner reserves the right to reject any and all bricks which, in his opinion, do not conform to the above specifications.

"Any brick may have a proper shrinkage, but shall not differ materially in size from the accepted samples of the same make, nor shall they differ greatly in color from the natural color of the well-burned brick of its class and manufacture.

"No bats or broken bricks shall be used except at the curbs, where nothing less than half a brick shall be used to break joints. The bricks to be laid in straight lines, and all joints broken by a lap of at least two inches, to be set on edge on the sand as closely and compactly as possible and at right angles with the line of the curb, except at street-intersections, where they are to be laid as the Street Commissioner may direct.

"The pavement to be thoroughly rammed two or three times with a paver's rammer weighing not less than seventy-five pounds The pavement to be surfaced up by using a long straight-edge and by a thorough rolling of the pavement with a road-roller weighing not less than three nor more than six tons, and when completed to conform to the true grade and cross-section of the road way.

"All joints in the pavement shall be completely filled with Portland-cement grout. The cement to be of brand approved by Street Commissioner, to be fine ground; eighty-five per cent. shall pass through a sieve having ten thousand meshes to the square inch. All cement shall be capable of withstanding a tensile strain of five hundred pounds per square inch of section, when mixed neat, made into briquettes and exposed twenty-four hours in air and six days under water. All cement shall be put up in well-made barrels, and all short weight or damaged barrels will be rejected. Cement without manufacturers' brand and other certificate will be rejected without test."

"The grout shall be mixed in portable boxes in the proportion of one part cement to one part sand. The cement and sand to be thoroughly mixed together dry, then sufficient water to be added to make a grout of proper fluidity when thoroughly stirred.

"The grout shall be transferred to the pavement in hand-scoops, or as the Street Commissioner may direct, and rapidly swept into the joints of the pavement with proper brooms.

"Teams, carts, and wagon traffic and wheeling in barrows, except on plank, will not be allowed on the pavement for at least seven days after the grout is applied.

* Leavenworth Street, Omaha, Neb., paved in 1892, under ten-year guarantee. This view shows the condition of the pavement at the end of ten years—it was in first-class condition and no repairs had been required. The paving brick used was of the standard size and made by the Purington Paving Brick Co., Galesburg, Ill.

"The surface of the pavement, when completed, shall be covered with one-half inch of clean, coarse sand of approved quality, which, with all dirt, shall be removed from the pavement and sewer-inlets, by or at the expense of the contractor, at such time, before the final acceptance of the work, as the Street Commissioner may direct."

The following are extracts from the Philadelphia specifications:

"The bricks or blocks must be set vertically on edge in close contact with each other, in straight rows across the street excepting at intersections, which shall be paved at an angle of forty-five degrees to the lines of the intersecting roadways, and those in adjoining rows so set as to regularly break joints. No bats or broken bricks or blocks can be used except at curbs, where half-bricks or blocks must be used to break joints. The bricks or blocks, having been set, must be rolled with the above-mentioned steam-roller.

"After being rolled, the surface of the roadway must be true to grade, and show no continuous lines of unequal settlements produced by the roller.

"After being thoroughly rolled, the bricks or blocks shall be grouted with Portland-cement grouting until the joints are filled flush with the surface of the bricks or blocks. The grouting to be composed of one part fresh-ground Portland cement and one part clean bar sand, and mixed with clean water to a consistency that will readily permeate the joints between the bricks."

THE END

# RAISING WATER WITH COMPRESSED AIR*

## What a Foreign Expert Engineer Thinks of the System—A Neglected Method Which Is Bound to Take Place of Less Efficient Systems

*By Philip R. Bjorling*

THIS, like most all appliances for raising water, is not by any means a new invention. Papin, the great inventor of the safety valve for steam boilers, proposed to raise water by it. He said that if a closed vessel, furnished with a pipe at the bottom and filled with water, had air let into it under pressure on the top of the water, the latter would pass out of the vessel to any height that may be required.

The application of compressed air to the raising of water in this country is, however, practically new, for until about six years ago we have no hesitation in saying that few had heard of the "Air-Lift Pump"; while to-day it may be found in use by scores of manufacturers, corporations, etc. It has come rapidly into use, because of its simplicity, as a means for raising water from deep wells, and is becoming popular because it affords a ready means of increasing the yield of wells that have begun to decrease in capacity.

There have been six methods employed in raising water by "Compressed Air":—

1. Displacement apparatuses in which compressed air is employed at a constant pressure.
2. Displacement apparatuses in which the air is used expansively.
3. Direct-acting pumps in which a constant pressure is carried the whole length of the stroke.
4. Direct-acting pumps in which the compressed air is allowed to expand.
5. Air-lift pumps, single and combined with displacement chamber.
6. Pumps operated by independent motors.

The principal reason why the compressed air method of raising water has not come to the front till recently is that air compressing has been very little studied practically, therefore, a great amount of loss in efficiency, hence great expense in working, and at the present time economy of power is a *sine qua non*. When a machine only gives an efficiency of 33 to 37 per cent. it is about time it was put on the shelf.

However, it is a very narrow view which takes in only the cost of fuel when calculating the cost of pumping deep wells. The conspicuous feature in the air-lift pump is that it takes all the water a well can supply, whereas any mechanical pump only bales out a certain number of bucketfuls per minute, which experience shows is almost always less than the well can give, sometimes not over one-fifth of this.

The amount of underground water available in a well or group of wells is governed by the catchment area of source which supplies the stratum, modified by the medium through which the water circulates, and the number of wells on the same shed. Any increase in the number of wells generally affects the static pressure, but the quantity of the water cannot be determined by rules of watershed measurement, as applied to surface supplies, unless the areas and surfaces supplying the wells are already defined.

The cost of water pumping includes not only the cost of fuel, but the interest on the amount necessary to construct the plant, and to

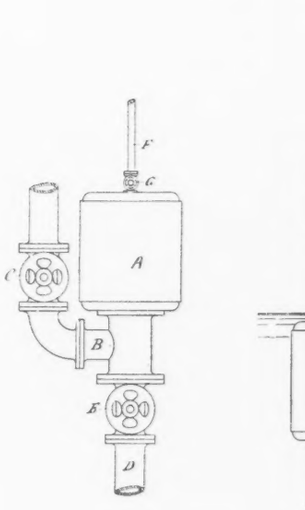


FIG. 1.

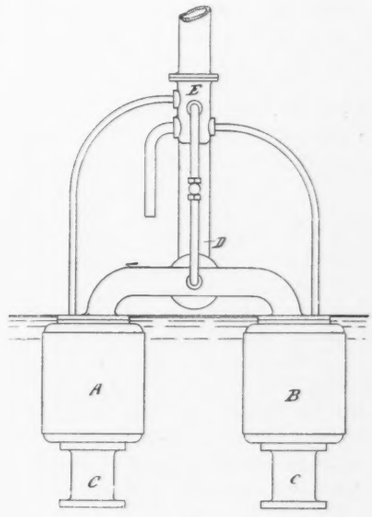


FIG. 2.

make a comparison on these lines the number of wells required to produce a certain amount of water should be figured for each system and the cost of the two plants of machinery and the interest on the two systems per year compared. This is an easy problem.

Another feature of the system, which can hardly be expressed in £ *s. d.*, but is no less important on that account, consists of the fact that the air lift has no working parts in the well. With any other system of deep well pumping occasional renewals for repairs must be made, and sooner or later something will break, leaving parts in the well which must be removed at an expense that cannot be calculated.

The great success in raising water by compressed air depends upon proper proportions of the various pieces of machinery, sizes of the compressor and steam cylinders, and the proper areas of the steam, air, and water pipes. For instance, if we want to compress air to 200 to 300 lbs. pressure per sq. in., it does not pay to perform the compression in one cylinder, a two-stage compressor must be adopted; if we do not calculate the steam cylinder area properly, and

* *Engineering Times*, London, England.

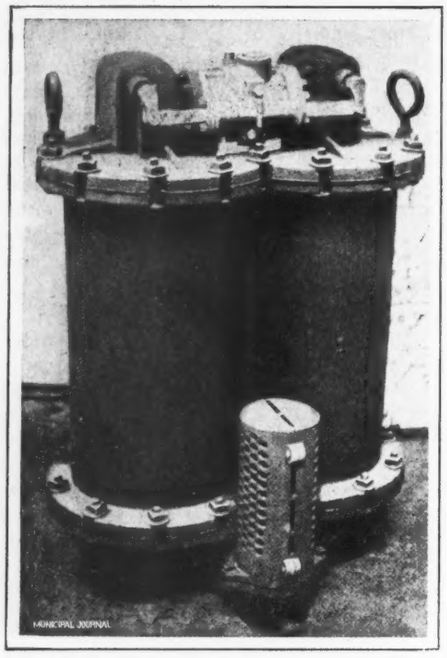


FIG. 3.—"CHAPMAN" PATENT INLET OR PNEUMATIC PUMP

do not apply a cut-off gear for the steam engine, we will lose these again; another loss is given by too small pipes. What can we expect if we work a single cylinder engine at 100 lbs. pressure per sq. in., and compress the air in one cylinder to 300 lbs. per sq. in.; and after that transmit the air to the air-lift pump by pipes so small that there is a loss of 20, 30, and even 50 per cent. by friction? That is frequently the state of affairs, and it is wondered why there is such a great amount of loss.

### The Displacement Apparatus in Which Compressed Air Is Employed at a Constant Pressure

Under this head comes the original idea of Papin. Take a tank or vessel, A, Fig. 1, of any description, provided with an outlet pipe, B, furnished with a cock, C, at the bottom, and a pipe, D, furnished with a cock, E, below, and another pipe, F, for admission of compressed air, also provided with a cock, G. Now, if we open the cock C and fill the vessel with water, turn off the cock E, and open the cocks C and G, admitting air under pressure through the pipe F, the water will be forced out of the delivery or outlet pipe, B, by the pressure of the air on the surface of the water in the vessel, similar to the action of the steam in the Pulsating Steam Pump (fully described by the writer in *The Engineering Times*, Vol. V., No. 3). It will be clearly seen that in this case the air is exhausted into the atmosphere at the same pressure as it was admitted into the vessel A. An automatic double-acting air lift is illustrated in Fig. 2. It consists of two vessels or displacement cylinders, A and B, each being provided with a suction pipe, C and C. The cylinders are placed under the lowest water level or other source. D is a delivery pipe or rising main, connected, by means of a branch pipe, to the cylinders. E is an automatic valve which distributes the compressed air to the displacement cylinders. The action of this apparatus is precisely the same as Fig. 1, except that it is double-acting, on account of the air being admitted alternately to the two cylinders by the automatic valve.

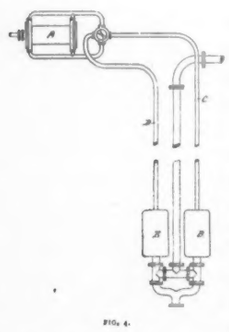


FIG. 4.

The last of this class of apparatus, the "Chapman" Patent Inlet or Pneumatic Pump, introduced into this country by the British-American Well Works, is shown in Fig. 3. This pump can be placed in a river, lake, or well, in any place of an ordinary pump for delivering water any height or distance, by the application of air under pressure, miles if necessary from the engine that puts up the air pressure. It delivers a continuous stream of water. When one of the chambers is filling, the air is forcing the water from the other to its destination.

The automatic mechanism requires no oil or attention; being inside, it is sand and dirt proof, there being no stuffing box to adjust or stop its action. It is provided with a large strainer, which prevents foreign substances entering. Its automatic switch, that switches the air from one cylinder to the other, is non-corrosive and balanced, requiring nominally no power to operate. It performs the service of a pump without pistons or working parts that are commonly worn. The air forms the piston, hence there is no wear. This apparatus will perform all the duties of moving water that a steam pump will, without loss by condensation. It will work successfully in water whose rise and fall may vary hundreds of feet. One gallon of air will bring the same amount of water a short distance, allowing 5/8-th lb. of air pressure for each foot of lift.

### Displacement Apparatus in Which the Air Is Used Expansively

This class of installation consists of two cylinders placed in the well or other source. The cylinders are, as in the previous examples, furnished with suction and delivery and air pipes. On the ground is fixed a double-acting air compressor and an automatic distributing valve. This arrangement is shown diagrammatically in Fig. 4. The action of the pump is as follows: As the automatic valve is shown in the diagram the air is passing from the right-hand end of the air cylinder, A, is in direct communication with the pump cylinder, B, through the pipe, C, and the suction or admission end of the air-compressor cylinder (the left-hand side of the piston) is through the pipe, D, in direct communication with the pump cylinder, E, so that the water is forced out of the water cylinder, B, up the rising main, and the air being drawn out of the pump cylinder, E, by the

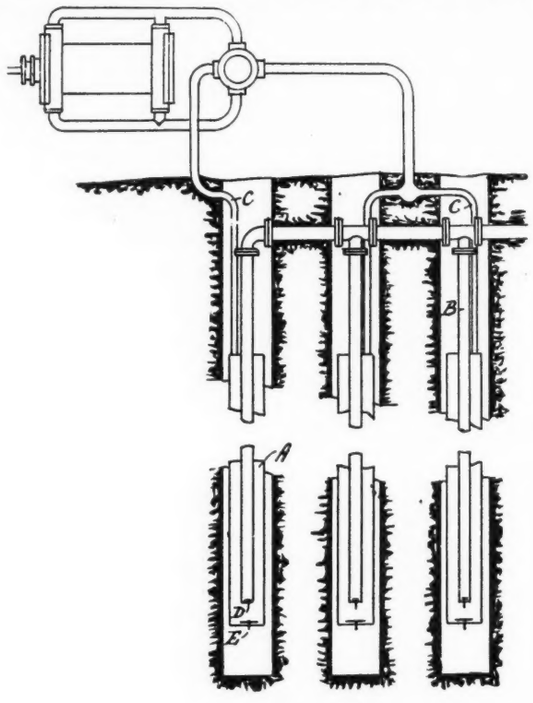



FIG. 5.

air-compressor piston, the water will rise up the suction pipe and fill the cylinder ready for being forced out when the automatic distributing valve changes its position, when the operation is reversed.

It is natural that if there are a number of wells or a number of water cylinders in each well, the air pipes can be so arranged that each end of the air-compressor cylinder can be connected with any number of water cylinders, although there ought to be the same number of cylinders for each end of the air compressor.

The "Harris" system, manufactured by the Pneumatic Engineering Company, of New York, is illustrated in Fig. 5, and shows a similar arrangement in which there are three wells worked by one single air compressor. In this the water cylinder, A, is very long and small in diameter, and the delivery pipe, B, passes nearly to the bottom of the water cylinder, and the compressed air pipe, C, is admitted into the top cover. Both the delivery pipe and the bottom of the cylinder are provided with valves, D and E, the former being the delivery and the latter the suction valves. The tank or cylinders are, of course, proportioned according to the capacity of the well.

Another arrangement is shown in diagram, Fig. 6. In this case the two water cylinders are placed at different levels, one delivering

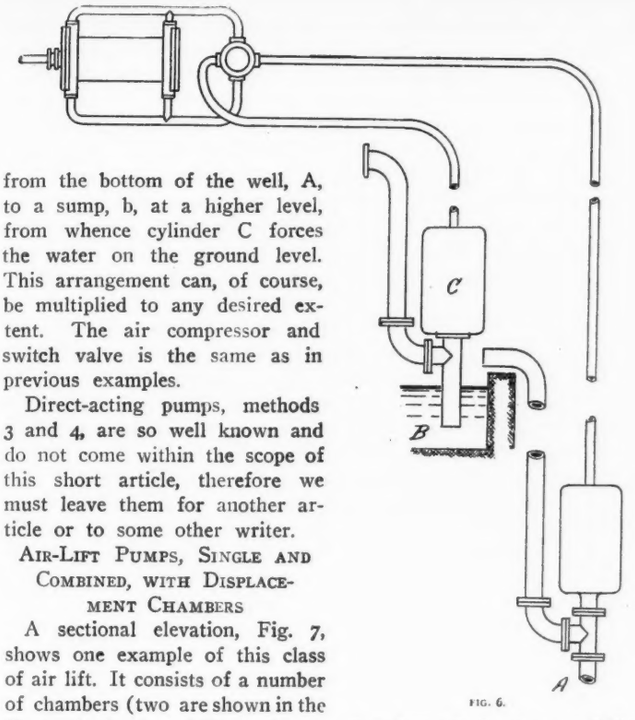



FIG. 6.

from the bottom of the well, A, to a sump, b, at a higher level, from whence cylinder C forces the water on the ground level. This arrangement can, of course, be multiplied to any desired extent. The air compressor and switch valve is the same as in previous examples.

Direct-acting pumps, methods 3 and 4, are so well known and do not come within the scope of this short article, therefore we must leave them for another article or to some other writer.

### Air-Lift Pumps, Single and Combined, with Displacement Chambers

A sectional elevation, Fig. 7, shows one example of this class of air lift. It consists of a number of chambers (two are shown in the illustration); A and B are the two chambers, the bottom one being submerged in the well, sump, or other source. C is the discharge pipe from the bottom chamber, and D the pipe from the second chamber to the ground, or to the chamber above if there are three lifts. E is the air-compressor pipe to the bottom chamber, and F the air pipe between the chambers. G is a check valve in each tank which opens and puts the tank in communication with the atmosphere whenever the pressure falls to that of the atmosphere inside the tank, and immediately closing when the water rises up against it. Now, if the bottom tank, A, is full of water and the air is admitted, the water will be displaced and forced into the tank, B, but when the water is discharged from A, and just before the delivery pipe, C, is uncovered, the end of the air pipe, E, is uncovered, and passed up into the chamber, B, expanding against the water, and forces it up into the next chamber or any other source.

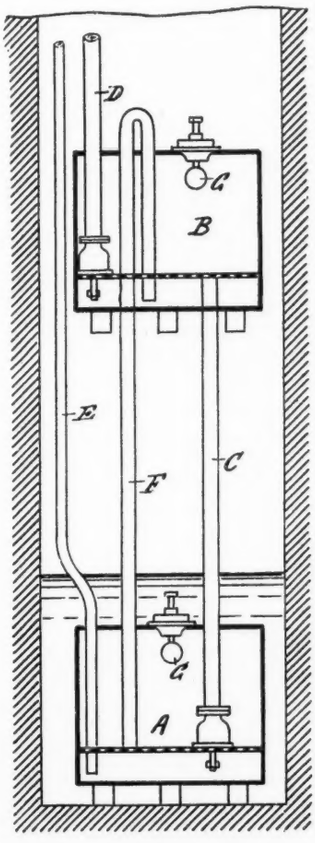



FIG. 7.

### The "Wheeler" Air Lift

This device is shown in Fig. 8. A is a displacement chamber, B the delivery pipe or raising main, C the delivery valve, D compressed air pipe, and E a small air pipe, opening an air connection for the bottom of the delivery pipe. In this case the displacement is permitted to take place with low pressure, and this adds to the efficiency of the apparatus.

### Pumps Operated by Independent Motors

We now come to the last class, which is no doubt the best, simplest, and cheapest if properly designed.

It is a peculiar feature of artesian wells that the conditions of no two are alike, and when this is borne in mind it will readily be understood that each well represents a problem requiring a special study.

Some makers of the air-lift pumps, to the detriment of the system, always recommend them, even when they are convinced that they are not suitable.

### The Theory of the Air-lift Pump

is best explained by reference to Fig. 9. If an open pipe, A B, is sunk in a vertical body of water and air is forced into its lower end, experiments have shown that the water will be raised in the pipe; the entering air current by its friction against the water carries it.

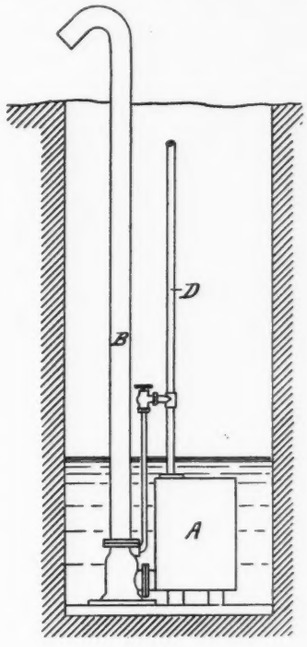



FIG. 8.

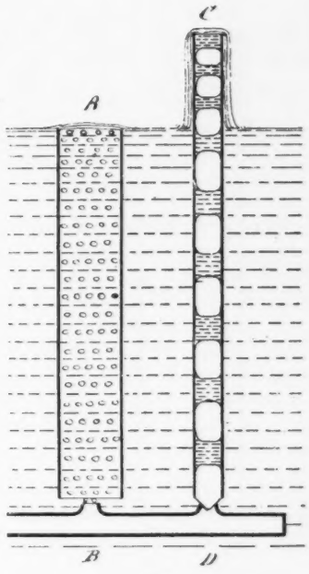



FIG. 9.

It has also been found that when the air is not forced into the bottom of the pipe, but is merely allowed to escape, the water is raised in the pipe. The rise of water in the pipe is due to the lessened weight in the pipe due to the space occupied by the air bubbles. Thus suppose the pressure at the mouth of the pipe A B due to the head of water outside to be 6 lbs. per sq. in. Now, if the air bubbles inside the pipe A B occupy one-third the space, and the water occupies two-thirds the space, then the pressure at the mouth of the pipe A B

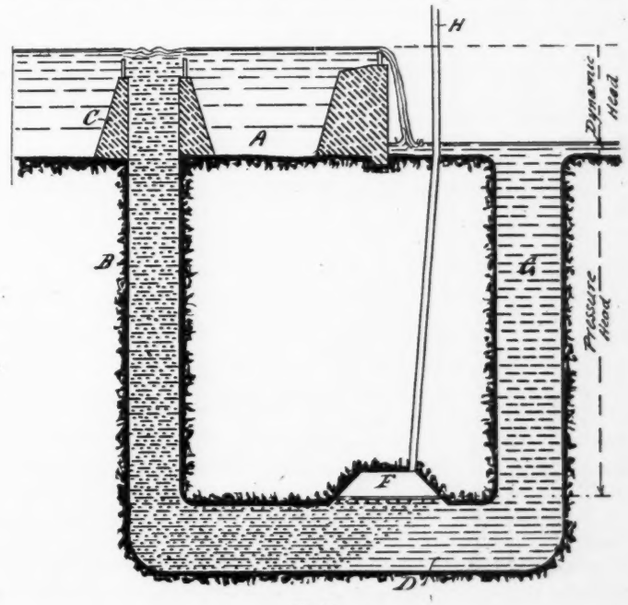



FIG. 10.

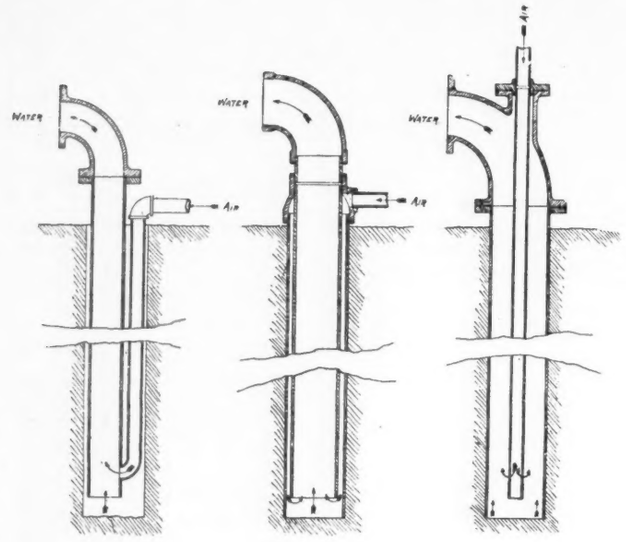



FIG. 11. FIG. 12. FIG. 13.

due to the weight of water inside it will be only 4 lbs. per sq. in. Of course, the water will rapidly flow into the pipe under these circumstances. Supposing the bubbles of air in the pipe are very small, so that they cannot rise freely through the water, we have really a mixture of the fluid. The specific gravity will be less than that of the water outside, and the water will rise because the interstices between the bubbles are too small for the water to flow down between them and exert its full head; or, on the other hand, if we go to the other extreme, and pass in air bubbles so large that they completely fill the bore of the pipe, then you will have alternate layers of air and water, as in the pipe C D. In this case, again, the water at the top of the pipe is shut off from communication with the lower end and cannot exert the full hydrostatic pressure there, due to its elevated position.

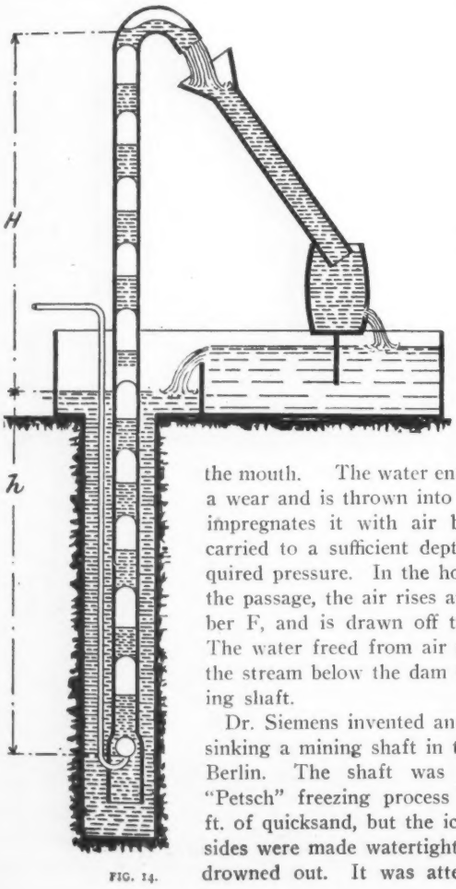



FIG. 14.

Mr. Joseph F. Frizell patented an air-lift pump in America in the year 1878. It is illustrated in Fig. 10, and was arranged in the following manner: A is a dam which causes a difference of level in the water above and below it. B is a descending shaft, with the curb C, built up around the mouth. The water enters the shaft G over a wear and is thrown into a commotion which impregnates it with air bubbles. These are carried to a sufficient depth to ensure the required pressure. In the horizontal port, D, of the passage, the air rises and enters the chamber F, and is drawn off through the pipe H. The water freed from air rises and returns to the stream below the dam through the ascending shaft.

Dr. Siemens invented an air-lift pump while sinking a mining shaft in the neighborhood of Berlin. The shaft was put down by the "Petsch" freezing process through about 100 ft. of quicksand, but the ice melted before the sides were made watertight, and the shaft was drowned out. It was attempted to stop the flow into the shaft by putting down numerous driven wells round the shaft; but these were so small in size that it was difficult to pump from them. It occurred to Dr. Siemens, therefore, to imitate the action of gas springs, geysers and flowing oil wells by conveying compressed air to the bottom of the well casing. The German paper "Zeitschrife des Vereins Deutscher Ingenieure" in 1885 pointed out that this system of lifting water was recommended by Loescher, of Freiberg, in a pamphlet published in 1797; but it does not appear to have been tried, except in laboratory experiments.

"The idea of such a lift (air-lift pump) is not a new one," says Professor W. H. Echols in a paper read by him before the Philosophical Society at the University of Virginia. In "Collen's Lecture on Mining" delivered at the School of Mines, in Paris, in his description of Trigard's method of sinking a mining shaft through very aquiferous strata at Chalonnes, by means of a pneumatic cylinder, he gives the following design for expelling water and sand from the lower compartment: "The mixture of air and water in a vertical pipe forms a kind of froth having a less density than water, thus allowing it to be raised to the surface, where it flows out."

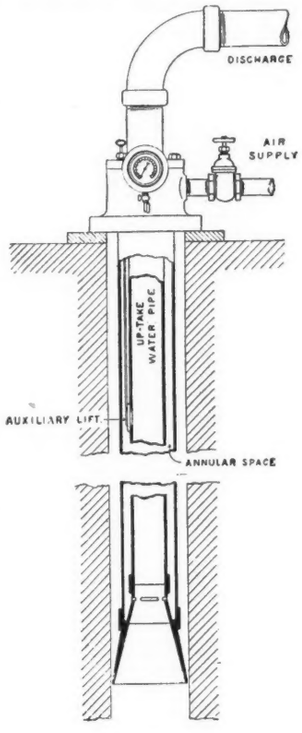



FIG. 17.

The "Pohle" Air-Lift Pump manufactured by the Ingersoll-Sergeant Company, is made in three distinct methods of well piping, each different from the other, and yet working on the same principle.

Method No. 1, Fig. 11, consists of placing the air and water pipes alongside of one another in the well, connecting them at the bottom with an end pipe.

Method No. 2, Fig. 12, consists of placing a water delivery pipe into the well, the air passing down into the well through the annular space between the well casing and the water pipe.

Method No. 3, Fig. 13, consists of using the well as the water delivery pipe and simply putting an air pipe down into the well with a special device attached to the bottom through which the air escapes.

The two properly proportioned pipes are placed in position. The compressed air is forced through the air pipe into the foot piece and water pipe, and by its inherent expansive force, layers or pistons of air are formed in the water pipe, which lifts and delivers the layers of water through the end of the water delivery pipe at the surface, or a tank.

At the beginning of the operation, the water surface of the pipe and the water surface inside the water pipe are at the same level; hence the vertical pressures per square inch are equal at the submerged end of the pipe, outside and inside. As the compressed air is forced into the lower end of the water pipe, it forms alternate layers with the water, so that the pressure per square inch of the column thus made up of air and water, as it rises inside of the water pipe, is less than the pressure per square inch outside of the water pipe. Owing to this difference of pressure, the water flows continually from the outside to within the water pipe by gravity, and its ascent through the pipe is free from shocks, jar, or noise of any kind.

These air sections or strata of compressed air form watertight bodies, which in their ascent in the act of pumping permit no "slipping" or back-flow of water. As each air stratum progresses upwards to the spout, it expands on its way in proportion as the overlaying weight of water is diminshed by its discharge, so that the air action, which may have been, say, 50 lbs. per sq. in. at first, will be only 1.74 lbs. when it underlies a water layer of 4 ft. in length at the spout, until finally this air section when it lifts up and throws out

4 ft. of water, is of the same tension as the normal atmosphere; thus proving that this pump is a perfect expansion engine.

The original "Pohlè" air-lift pump tested by Professor Randall in company with Messrs. Browne and Behr is illustrated in Fig. 14. This pump showed the following efficiencies:

$$\text{For } \frac{H}{h} = 0.5 \text{ . } 50 \text{ per cent.}$$
$$\text{“ “ } = 1.0 \text{ . } 40 \text{ “}$$
$$\text{“ “ } = 1.5 \text{ . } 30 \text{ “}$$
$$\text{“ “ } = 2.0 \text{ . } 25 \text{ “}$$

A "Pohlè" air-lift pump is used at Charleston, S. C. This well is 1,950 ft. deep, cost £48,000, and had a natural flow of 5,150 gallons per hour. Compressed air was applied, and after two months' pumping, during which time over 200 tons of quicksand was raised (a pile of which is shown in the illustration), it was made to yield 12,500 gallons per hour of clear and pure water, the supply of incoming quicksand having been exhausted.

A well at Fort Madison, Iowa, waterworks is 12 in. diameter, and by the air lift pump system it is now discharging 30,000 gallons of water per hour, forcing it 40 ft. above the surface. With an increased volume of compressed air this yield can be more than tripled.

THE "BACON" AIR LIFT

is illustrated in sectional elevation, Fig. 17. The well head and foot piece are secured by patents. The uptake is suspended in the centre of the air pipe receiver, the lower edge of its bill-shaped attachment making a tight joint with the bell-shaped piece which is supported by the air pipe receiver.

In wells drilled through sand strata and having a strainer at the bottom of the well casing, the top of the uptake pipe may be closed and a sudden back pressure exerted on the well, the flow of water reversed, and the sand embedded against the strainer removed. After thoroughly cleaning a well the apparatus is adjusted to its regular duty.

In the use of compressed air in pumping artesian wells is secured the beneficial result from aeration. The air is thoroughly mixed with the water, giving it a pure and sparkling appearance. This is a point worthy of the consideration of every brewery depending upon artesian water for brewing purposes. It is also important to factories where the employees use artesian water for drinking purposes.

# WATER CONSUMPTION IN AMERICAN CITIES

## The Effect of Applying Meters—A Valuable Study in Water Meter Statistics by an Expert Engineer—Why Water Meters Should Be Used

*By E. Kuichling*

HAVING recently had occasion to study the consumption of water in one of our Southern cities, it has occurred to the writer that the data and results obtained may be of interest to the readers of the MUNICIPAL JOURNAL AND ENGINEER, and the same are accordingly submitted. The data were taken from the extensive compilation of the statistics of water consumption in one hundred and thirty-seven large American cities, which was made early in 1901, from special official reports obtained by Mr. Geo. I. Bailey, C. C., then superintendent of the Albany, N. Y., water works, and which was published in the Journal of the New England Water Works Association, Vol. 15, p. 351. These data are probably the most reliable of their kind of recent origin, and possess particular interest in following so soon after the U. S. Census enumeration of inhabitants in the summer of 1900.

In the original reports, the number of consumers or persons actually supplied was not given in many cases, and where it was given the figures are presumably estimates. There is a decided difference of opinion among water works officials as to the difinition of the word "consumer." In the New England and Middle States, a consumer is generally considered to be an individual, while in some other parts of the country a consumer is regarded as the aggregate of the individuals who are supplied from a single tap or service pipe. In the published table the first named definition was adopted; and in all cases where the number of taps was not given, it was assumed that there was one tap for every six persons. As many of the reports gave such number, the error in the final result due to the said assumption, is probably insignificant.

Another source of confusion in such statistics is the distinction between the total number of taps, or service pipes, and the number thereof which are in active use. In many large cities, hundreds of such taps or pipes are provided for vacant lots on suburban streets which have been permanently improved with costly pavements; and in other cases numerous old taps or service pipes have been disused or disconnected, without being removed either from the ground of from the office books. It is, therefore, important that a uniform practice in regard to all these statistics shall soon be adopted.

For the purpose of the inquiry under consideration, the data relating to sixty cities varying from 27,000 to 575,000 inhabitants, and having the largest percentages of water meters are taken. Of these, sixteen are distinctly Southern cities, eleven are in Pennsylvania, New Jersey and Kansas, and thirty-three are in Northern states. They were first divided into two general classes, according as the original reports indicated the actual number of consumers or not, and were then subdivided into six groups according to locality. Thus, Groups 1 and 2 refer to the sixteen Southern cities, from which New Orleans, Baltimore and Washington, were omitted because of the small number of meters therein and anomalies in some of the figures; Groups 3 and 4 relate to the eleven cities in Pennsylvania, New Jersey and Kansas, which may represent conditions intermediate between the South and the North; and Groups 5 and 6 refer to thirty-three distinctively Northern cities, with populations ranging from 28,000 to 285,000. In Group 6, the city of Covington, Ky., has been included, as well as in Group 2, on account of its high percentage of meters.

The cities in the several groups are arranged according to the percentage of taps metered, the object being to ascertain if there was any well-defined relation between the average consumption per head of users and such percentage. The result is not very satisfactory, but in spite of the wide range in the rates of consumption, it is clear that such rate becomes less as the number of meters is increased.

For one hundred and thirty-four cities in Mr. Bailey's table, he found an average daily consumption of 137 gallons per inhabitant, based on a total population of 17,658,288, using an aggregate of 2,415,617,000 gallons of water per day, with 14.9 per cent. of all taps metered. For the sixty cities considered by the writer, the average daily consumption by an aggregate population of 4,928,045 is 95 gallons per inhabitant, with an average of 35.6 per cent. of all taps metered, and 7.87 inhabitants per tap. On the other hand, if the consumers, or number of persons actually supplied with water, are considered, the writer's results for the thirty-one cities for which this number is given, are 117 gallons per head per day, with 26.8 per cent. of all taps metered, and 6.60 consumers per tap.

For the sixteen Southern cities, constituting Groups 1 and 2, it is found that the average daily consumption is 100 gallons per inhabitant, with 16.4 per cent. of all taps metered and 8.21 inhabitants

per tap; for the eleven intermediate cities, constituting Groups 3 and 4, it is 121 gallons per inhabitant, with 7.0 per cent. of all taps metered and 6.81 inhabitants per tap; and for the thirty-three Northern cities, constituting Groups 5 and 6, it is 87 gallons per inhabitant, with 52.9 per cent. of all taps metered and 7.95 inhabitants per tap.

By this method of dealing with the data in large groups, the effect of applying water meters to the service pipes is exhibited much more clearly than in individual cases, and it is hoped that further work in this direction will soon be forthcoming.

Attention is also called to the difference in the average daily consumption when based on the actual number of consumers, and when based on the number of inhabitants. The former is preferable in all respects, and it is not a great task for those in charge of the water works of a city to make a very close estimate of the number of inhabitants who are not supplied directly with water from the mains.

## WATER CONSUMPTION IN SIXTY CITIES

| | City | Population | | Gallons per Day | | | No. of Taps | No. of Meters | Per Cent. of Taps Metered | Number of | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Census, 1900 | Actually Supplied | Total | Per Inhabitant | Per Consumer | | | | Inhabitants Per Tap | Consumers Per Tap | |
| | **Group No. 1.** | | | | | | | | | | | |
| 1. | Atlanta, Ga. | 89,872 | 65,000 | 5,444,000 | 60 | 84 | 9,275 | 8,500 | 91.64 | .... | .... | 1. |
| 2. | Jacksonville, Fla. | 28,429 | 20,000 | 2,136,000 | 75 | 107 | 2,335 | 1,154 | 49.42 | .... | .... | 2. |
| 3. | Knoxville, Tenn. | 32,637 | 23,400 | 2,800,000 | 86 | 120 | 4,250 | 380 | 8.94 | .... | .... | 3. |
| 4. | Memphis, Tenn. | 102,320 | 80,000 | 10,000,000 | 98 | 125 | 9,666 | 800 | 8.28 | .... | .... | 4. |
| 5. | Louisville, Ky. | 204,731 | 160,000 | 16,000,000 | 78 | 100 | 20,755 | 1,560 | 7.52 | .... | .... | 5. |
| 6. | St. Louis, Mo. | 575,200 | 400,000 | 63,530,000 | 110 | 159 | 65,688 | 4,133 | 6.29 | .... | .... | 6. |
| 7. | Wilmington, Del. | 76,508 | 76,500 | 6,930,000 | 90 | 90 | 15,000 | 640 | 4.27 | .... | .... | 7. |
| 8. | Norfolk, Va. | 46,624 | 40,000 | 5,250,000 | 113 | 131 | 8,500 | 178 | 2.09 | .... | .... | 8. |
| 9. | Mobile, Ala. | 38,469 | 19,500 | 2,800,000 | 73 | 144 | 3,890 | 31 | 0.80 | .... | .... | 9. |
| | Totals | 1,194,790 | 884,400 | 114,890,000 | ... | ... | 139,359 | 17,376 | ..... | .... | .... | |
| | Averages | 132,754 | 98,267 | 12,765,500 | 96 | 130 | 15,484 | 1,931 | 12.46 | 8.57 | 6.34 | |
| | **Group No. 2.** | | | | | | | | | | | |
| 1. | Lexington, Ky. | 26,369 | ..... | 1,250,000 | 47 | ... | 2,500 | 1,482 | 99.47 | .... | .... | 1. |
| 2. | Covington, Ky. | 42,938 | ..... | 2,500,000 | 58 | ... | 5,300 | 4,150 | 78.30 | .... | .... | 2. |
| 3. | Nashville, Tenn. | 80,865 | ..... | 11,300,000 | 140 | ... | 7,720 | 3,200 | 41.45 | .... | .... | 3. |
| 4. | Richmond, Va. | 85,050 | ..... | 10,048,000 | 118 | ... | 14,781 | 4,500 | 30.44 | .... | .... | 4. |
| 5. | Newport, Ky. | 28,301 | ..... | 2,000,000 | 71 | ... | 5,000 | 470 | 9.40 | .... | .... | 5. |
| 6. | San Antonio, Tex. | 53,321 | ..... | 8,500,000 | 159 | ... | 9,100 | 100 | 1.10 | .... | .... | 6. |
| 7. | Savannah, Ga. | 54,244 | ..... | 6,000,000 | 110 | ... | 8,000 | 45 | 0.56 | .... | .... | 7. |
| | Totals | 371,088 | ..... | 41,598,000 | ... | ... | 51,401 | 13,947 | ..... | .... | .... | |
| | Averages | 53,013 | ..... | 5,942,600 | 112 | ... | 7,343 | 1,992 | 27.14 | 7.22 | .... | |
| | **Group No. 3.** | | | | | | | | | | | |
| 1. | Paterson, N. J. | 105,171 | 98,000 | 12,600,000 | 120 | 129 | 11,108 | 2,299 | 20.71 | .... | .... | 1. |
| 2. | Easton, Pa. | 25,238 | 25,000 | 2,000,000 | 79 | 80 | 2,200 | 100 | 4.55 | .... | .... | 2. |
| 3. | Reading, Pa. | 78,961 | 77,000 | 7,180,000 | 91 | 92 | 15,885 | 636 | 4.00 | .... | .... | 3. |
| 4. | Altoona, Pa. | 38,975 | 37,900 | 3,600,000 | 92 | 95 | 8,496 | 225 | 2.64 | .... | .... | 4. |
| 5. | Williamsport, Pa. | 28,757 | 26,000 | 4,500,000 | 156 | 173 | 4,371 | 85 | 1.94 | .... | .... | 5. |
| 6. | Camden, N. J. | 75,935 | 50,000 | 14,000,000 | 184 | 280 | 14,000 | 197 | 1.41 | .... | .... | 6. |
| 7. | Johnstown, Pa. | 35,936 | 33,000 | 4,750,000 | 132 | 144 | 4,100 | 40 | 0.98 | .... | .... | 7. |
| | Totals | 388,973 | 337,800 | 48,630,000 | ... | ... | 60,160 | 3,582 | ..... | .... | .... | |
| | Averages | 55,568 | 48,257 | 6,947,100 | 125 | 144 | 8,594 | 512 | 5.96 | 6.46 | 5.61 | |
| | **Group No. 4.** | | | | | | | | | | | |
| 1. | Kansas City, Kan. | 51,418 | ..... | 4,301,000 | 84 | ... | 2,370 | 750 | 31.65 | .... | .... | 1. |
| 2. | McKeesport, Pa. | 34,227 | ..... | 2,500,000 | 73 | ... | 3,833 | 754 | 19.67 | .... | .... | 2. |
| 3. | Lancaster, Pa. | 41,459 | ..... | 6,000,000 | 145 | ... | 6,000 | 500 | 8.33 | .... | .... | 3. |
| 4. | Erie, Pa. | 52,733 | ..... | 7,458,000 | 142 | ... | 11,163 | 266 | 2.38 | .... | .... | 4. |
| | Totals | 179,837 | ..... | 20,259,000 | ... | ... | 23,366 | 2,270 | ..... | .... | .... | |
| | Averages | 44,959 | ..... | 5,064,750 | 113 | ... | 5,842 | 568 | 9.72 | 7.70 | .... | |
| | **Group No. 5.** | | | | | | | | | | | |
| 1. | Yonkers, N. Y. | 47,931 | 45,000 | 3,627,000 | 76 | 81 | 4,968 | 4,852 | 97.67 | .... | .... | 1. |
| 2. | Worcester, Mass. | 118,421 | 113,000 | 7,920,000 | 67 | 70 | 13,292 | 12,536 | 94.31 | .... | .... | 2. |
| 3. | Fall River, Mass. | 104,863 | 104,500 | 3,805,000 | 36 | 36 | 6,943 | 6,544 | 94.25 | .... | .... | 3. |
| 4. | Newton, Mass. | 33,587 | 32,800 | 2,086,000 | 62 | 64 | 7,087 | 6,001 | 84.68 | .... | .... | 4. |
| 5. | Brockton, Mass. | 40,063 | 35,000 | 1,165,000 | 29 | 32 | 5,275 | 4,300 | 81.51 | .... | .... | 5. |
| 6. | Lawrence, Mass. | 62,559 | 57,200 | 3,204,000 | 51 | 56 | 5,926 | 4,386 | 74.01 | .... | .... | 6. |
| 7. | Lincoln, Neb. | 40,169 | 25,000 | 2,000,000 | 50 | 80 | 3,550 | 2,000 | 56.34 | .... | .... | 7. |
| 8. | Fitchburg, Mass. | 31,531 | 25,000 | 3,000,000 | 95 | 120 | 4,437 | 2,427 | 54.70 | .... | .... | 8. |
| 9. | Lowell, Mass. | 94,969 | 94,000 | 8,000,000 | 83 | 83 | 10,634 | 5,586 | 52.53 | .... | .... | 9. |
| 10. | Davenport, Ia. | 35,254 | 20,000 | 3,000,000 | 85 | 150 | 4,000 | 1,500 | 37.50 | .... | .... | 10. |
| 11. | Columbus, O. | 125,560 | 100,000 | 23,000,000 | 184 | 230 | 14,608 | 4,960 | 33.95 | .... | .... | 11. |
| 12. | Bay City, Mich. | 27,628 | 17,000 | 3,000,000 | 109 | 177 | 2,200 | 826 | 37.54 | .... | .... | 12. |
| 13. | Paterson, N. J. | 105,171 | 98,000 | 12,600,000 | 120 | 129 | 11,108 | 2,299 | 20.71 | .... | .... | 13. |
| 14. | Hartford, Conn. | 79,850 | 79,850 | 8,500,000 | 106 | 106 | 9,351 | 2,550 | 27.27 | .... | .... | 14. |
| 15. | Rochester, N. Y. | 162,608 | 160,000 | 13,500,000 | 83 | 84 | 34,549 | 8,752 | 25.33 | .... | .... | 15. |
| | Totals | 1,110,164 | 1,006,350 | 98,407,000 | ... | ... | 137,928 | 69,519 | ..... | .... | .... | |
| | Averages | 74,011 | 67,090 | 6,560,500 | 89 | 98 | 9,195 | 4,637 | 50.43 | 8.05 | 7.30 | |
| | **Group No. 6.** | | | | | | | | | | | |
| 1. | Bayonne, N. J. | 32,722 | ..... | 3,071,000 | 94 | ... | 3,000 | 3,000 | 100.00 | .... | .... | 1. |
| 2. | Utica, N. Y. | 56,383 | ..... | 3,000,000 | 53 | ... | 7,064 | 6,838 | 96.80 | .... | .... | 2. |
| 3. | Woonsocket, R. I. | 28,204 | 32,000 | 933,000 | 33 | 29 | 2,347 | 2,136 | 91.01 | .... | .... | 3. |
| 4. | Providence, R. I. | 175,597 | 187,300 | 10,130,000 | 58 | 54 | 21,566 | 17,813 | 82.60 | .... | .... | 4. |
| 5. | Covington, Ky. | 42,938 | ..... | 2,500,000 | 58 | ... | 5,300 | 4,150 | 78.30 | .... | .... | 5. |
| 6. | Atlantic City, N. J. | 27,838 | 28,500 | 2,280,000 | 82 | 80 | 4,249 | 3,298 | 77.62 | .... | .... | 6. |
| 7. | Pawtucket, R. I. | 39,231 | 80,000 | 6,524,000 | 166 | 82 | 8,293 | 6,369 | 76.80 | .... | .... | 7. |
| 8. | Milwaukee, Wis. | 285,300 | 300,000 | 24,000,000 | 84 | 80 | 41,485 | 28,039 | 67.59 | .... | .... | 8. |
| 9. | Manchester, N. H. | 56,987 | ..... | 3,500,000 | 61 | ... | 5,500 | 3,700 | 67.27 | .... | .... | 9. |
| 10. | Des Moines, Ia. | 62,139 | ..... | 3,000,000 | 48 | ... | 7,409 | 4,289 | 57.19 | .... | .... | 10. |
| 11. | Sioux City, Ia. | 33,111 | ..... | 1,427,000 | 43 | ... | 3,000 | 1,525 | 50.83 | .... | .... | 11. |
| 12. | Quincy, Ill. | 36,252 | ..... | 1,650,000 | 46 | ... | 2,700 | 1,300 | 48.15 | .... | .... | 12. |
| 13. | Syracuse, N. Y. | 108,374 | ..... | 11,000,000 | 102 | ... | 17,000 | 8,037 | 47.28 | .... | .... | 13. |
| 14. | Dayton, O. | 85,333 | ..... | 5,300,000 | 62 | ... | 12,000 | 5,600 | 46.67 | .... | .... | 14. |
| 15. | Malden, Mass. | 33,664 | ..... | 1,700,000 | 50 | ... | 6,426 | 2,935 | 45.67 | .... | .... | 15. |
| 16. | Omaha, Neb. | 102,555 | ..... | 18,000,000 | 176 | ... | 11,000 | 3,800 | 34.55 | .... | .... | 16. |
| 17. | Passaic, N. J. | 27,777 | ..... | 2,500,000 | 90 | ... | 2,900 | 929 | 32.03 | .... | .... | 17. |
| 18. | Minneapolis, Minn. | 202,718 | ..... | 18,813,000 | 93 | ... | 18,800 | 5,175 | 27.53 | .... | .... | 18. |
| 19. | Newark, N. J. | 246,070 | 255,000 | 24,000,000 | 98 | 94 | 33,500 | 7,342 | 21.92 | .... | .... | 19. |
| | Totals | 1,683,103 | ..... | 143,328,000 | ... | ... | 213,629 | 116,275 | ..... | .... | .... | |
| | Averages | 88,589 | ..... | 7,543,600 | 85 | ... | 11,244 | 6,120 | 54.43 | 7.88 | .... | |
| | **Averages for Cities Composing Different Groups** | | | | | | | | | | | |
| | Groups 1, 3—16 cities | 98,985 | 76,388 | 10,220,000 | 103 | 134 | 12,470 | 1,310 | 10.51 | 7.94 | 6.13 | |
| | Groups 1, 3, 5—13 cities | 86,901 | 71,889 | 8,449,300 | 97 | 117 | 10,885 | 2,919 | 26.80 | 7.98 | 6.60 | |
| | Groups 2, 4—11 cities | 50,084 | ..... | 5,623,400 | 112 | ... | 6,797 | 1,474 | 21.69 | 7.37 | .... | |
| | Groups 2, 4, 6—36 cities | 74,471 | ..... | 6,839,500 | 92 | ... | 9,613 | 4,416 | 45.94 | 7.75 | .... | |
| | Groups 1 to 6—60 cities | 80,788 | ..... | 7,658,200 | 95 | ... | 10,260 | 3,655 | 35.63 | 7.87 | .... | |
| | Totals, Groups 1 to 6 | 4,928,045 | ..... | 467,112,000 | 95 | ... | 625,843 | 222,969 | 35.63 | 7.87 | .... | |
| | Groups 1, 2—16 cities | 97,867 | ..... | 9,780,500 | 100 | ... | 11,923 | 1,958 | 16.41 | 8.21 | .... | |
| | Groups 3, 4—11 cities | 51,710 | ..... | 6,262,600 | 121 | ... | 7,593 | 532 | 7.01 | 6.81 | .... | |
| | Groups 1 to 4—27 cities | 79,063 | ..... | 8,347,300 | 106 | ... | 10,159 | 1,377 | 13.56 | 7.78 | .... | |
| | Groups 5, 6—34 cities | 82,157 | ..... | 7,109,900 | 87 | ... | 10,340 | 5,465 | 52.85 | 7.95 | .... | |

# METHODS OF DISINFECTION IN CAPITAL CITY

In speaking of the methods employed by the Health Department of Washington, D. C., in disinfecting rooms in which have been confined people suffering from contagious diseases, Dr. W. C. Woodward, the health officer is quoted as follows:

"The Health Department undertakes the disinfection of premises rather than leave such work to be done by householders, because it should in this manner develop a corps of trained disinfectors whose work could, prima facie, be regarded as correct, and which work can, moreover, be tested as occasion indicates by technical methods to determine the efficiency of the disinfection. The householder is by this method, too, relieved of any danger incident to the work. The Health Department has under its jurisdiction a thoroughly equipped disinfecting station for the disinfection of movable goods which require special treatment.

"As soon as a patient suffering from any of the minor contagious diseases has recovered, the premises are visited by the medical sanitary inspector of the Department, who is connected with the contagious disease service. At the time of his visit he determines what disinfection is necessary, and how it should be done. His report on the case involves a statement of the goods which should be removed to the disinfecting plant for special treatment. On the following day (except when Sunday intervenes) the men employed in the disinfecting service visit the premises and undertake to do a surface disinfection by means of formaldehyde, the apartment or apartments to be disinfected having first been tightly closed so as to prevent the escape of the formaldehyde gas therefrom.

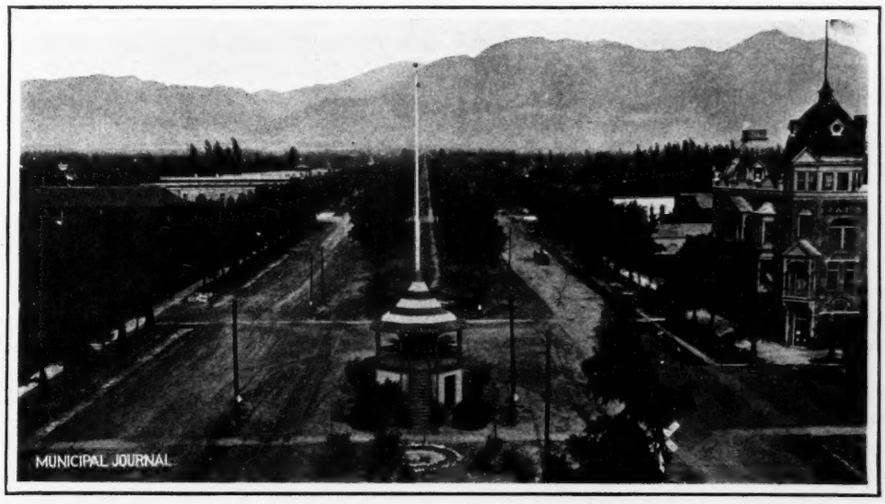
"The formaldehyde gas is liberated either by means of a solution sprinkled on sheets hung in the room or by means or a formaldehyde generator, which evolves the gas on the outside of the room and discharges it through the keyhole or through the hole left by the removal of the door knob. In order to generate sufficient gas one pint of the 40 per cent. formaldehyde solution is used for every thousand cubic feet of air space in the apartment. The apartment is then required to be kept closed for a period of six or eight hours. At the expiration of that time the windows are opened so as to permit the escape of the gas which may remain. If any of the contents of the room have to be taken to the disinfecting station for further treatment they can then be removed with comparative safety, as the formaldehyde gas, properly used in the manner suggested above, kills such germs as may be superficially located. As an additional precaution, however, these goods are wrapped in large sheets before being taken through the house and over the sidewalk to the wagon used for the transportation of these articles. The occupants of the infected premises are advised, as a further precaution, to wash off all woodwork, unpapered walls, etc., with the standard disinfecting solution described in the pamphlet relative to scarlet fever and diphtheria, which is left in the house when the case occurs.

"The goods taken to the disinfecting station are commonly treated by means of formaldehyde introduced into a partial vacuum, surrounded by a steam jacket. In this way the penetration of the gas into the substance of the articles to be disinfected is insured. If necessary, however, disinfection may be done at the same station by means of superheated steam. Provision is made, moreover, for the use of disinfecting solutions in large vats specially built for the purpose.

"Goods are delivered at the disinfecting station in an entrance on one side of the building and pass thence through the disinfecting chamber, coming out disinfected at the other side. While the goods are being disinfected the wagon itself is thoroughly washed down with a disinfecting solution. This is done, although the infection of the wagon is largely theoretical, in view of the fact that its contents have been disinfected by formaldehyde before being placed in the wagon, and are, moreover, wrapped in a disinfected sheet. Sheets used for the disinfection go through the disinfecting chamber each time they are used, and are, therefore, thoroughly disinfected. The suits worn by the men are treated in the same manner each day. The workmen employed in the service are required to wear these suits, which are provided by the Health Department, and are of such a character as to minimize the danger of becoming infected. They are worn by the men only while on duty.

"From time to time, as indicated; tests are made of the efficiency of disinfection. This is done by introducing into the apartment to be disinfected or into the disinfecting chamber at the disinfecting station germs incapable of causing disease, but which can be killed practically only under conditions similar to those required for the destruction of disease-producing organisms. When the disinfection of the room is supposed to be completed these germs are removed and examined to determine whether they have or have not been killed.

"The results accomplished by the service have been generally, as determined by scientific tests, satisfactory. From the standpoint of practical results it may be said that in no case so far as the Department knows, has a case of any of these diseases developed under conditions that would lead it to believe that infection had been acquired through premises or goods once subjected to the disinfecting process by the Health Department or through men engaged in the disinfecting service."




EUCLID AVENUE, ONTARIO, CAL.—TWO HUNDRED FEET WIDE, SEVEN MILES LONG—SIERRA MADRE MOUNTAINS IN BACKGROUND

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NEW YORK, DECEMBER, 1903

## An Appeal for Reduction of Dust Nuisance

One of the most important vitiating factors in our atmosphere is dust. The quantity and quality of the dust vary with the environment and the locality. For example, high altitudes and sea air contain but little dust of any kind, while the air in our cities, particularly manufacturing cities, contains an enormous quantity. As sanitary and municipal engineers you are particularly interested in the dust of our cities and towns, particularly the dust of the streets of these cities and towns. A dusty city, or a city with dusty streets, is not only disagreeable, but it is unhealthful.

### Dust As Cause of Disease

Vital statistics teach us that those engaged in occupations which are accompanied by the formation of such dust, either organic or inorganic, are very susceptible to many forms of diseases of the respiratory organs. Such occupations as coal miners, charcoal burners, coal-handlers, firemen, chimney sweeps, foundry men, lead-pencil makers, etc., are all obliged to breathe into their lungs the finely pulverized dust characteristic of their environment. Chronic bronchial catarrh is very common among these workmen, and their expectation of life is much below the average.

In many of our cities, does it not seem as if conditions existed at times, that were an excellent imitation of the conditions surrounding many of the above described workmen? Take for example a large manufacturing city, perhaps one with an elevated railroad using steam for its motive power, the large manufactories using soft coal and many of the larger buildings both public and private, using this same fuel, what are the results? We get about as much soot and dirt on our clothes and in our lungs as the coal miner. The miner, on the other hand, has to work but a limited number of hours, while the citizen has to breathe the soot laden atmosphere night and day, awake and asleep.

In this day of enthusiasm over microbes, perhaps we are losing sight of some other important factors that produce disease. This soot and coal dust is perfectly harmless when inoculated into any form of animal, and yet this finely divided coal, together with any other form of pulverized lifeless matter, does have a very considerable effect on the delicate mucous membranes of the eye, nose and tnroat, and not infrequently the lungs themselves.

Nature has provided the human body with a device for preventing dust of whatever kind from getting into the inner respiratory passages and the lungs. The nose, the first of all, a course filter or seive constructed of hairs, that serves to take out the very course particles. Back of this filter of hairs, the nasal passages are lined with a delicate ciliated epithethial member, the small cilia or whip lashes being constantly in motion producing a current of the mucous always away from the lungs, always toward the outside. This current of moisture would take care of a great deal of the dust passing through the air passages, but when the dust exists in the atmosphere in very large quantities the ciliated epithethial cells cannot be expected to shovel it all to the outside. Then again, a large proportion of the people do something habitually that, for their own good, they should not do, and that is, breathe through their mouths. The mouth is not provided with any filter or sieve, and the moisture in the mouth is the only factor that tends to hold the dust. When one collects a mouthful of dust in this way, he has to do one of two very unsanitary things. He either has to spit, to get rid of it, or else he has to swallow it. It is not such a bad motto after all to keep one's mouth shut.

As we come into such close contact with this dust from the city streets, perhaps it will not be out of place here to make a short study of its composition. A microscopical examination shows that it is made up, first of all, of a great deal of pulverized material of one kind or another, the kind depending on the nature of the pavement. Then there is much more or less dried and pulverized animal excrement, from horses, birds, dogs, and other animals. Hairs from the above mentioned animals, as well as from men and women, feathers from birds, pieces of dandruff and the like, scales from the skin, fibres from all kinds of clothing, pollen from various plants, including many of the common weeds, dried sputum, dried nasal discharges, dried urine. Many forms of animal and vegetable spores, including molds, yeasts, bacteria, algæ, diatoms, and infusoria.

These various kinds of materials found in street dust affect the health of the human body in different ways, some possibly having no effect whatever. The finely pulverized materials such as soot, ashes, and coal dust, undoubtedly have some more or less irritating effect on the respiratory organs, and sooner or later bring about such diseases as bronchial catarrh. Smooth particles of dust do not seem to have the predisposing effect to consumption that the sharp angular granules do. These latter set up an irritation and inflammation, that paves the way for infection with the bacillus tuberculosis, the germ of the great white plague, consumption.

The particles of animal excrement may not be actually harmful if the animal from which they were discharged was healthy at the time. But it certainly is not pleasant, and does not sound sanitary, to have a large piece of partially dried horse-dung blown into one's mouth, as not infrequently happens in our cities on a windy day. If the animals are diseased, however, the conditions become very much more serious. Moreover, there are diseases of the respiratory organs of the lower animals that are transmissible to man. For example, dogs and cats are known to have and transmit diphtheria.

Then the pollen from various plants, particularly some of the common weeds, undoubtedly aggrevates and perhaps directly causes asthma, rose colds, and hay fever.

Other diseases, mainly of the respiratory organs, caused by the inorganic or non-living particles of dust, include catarrh in various forms, bronchitis, and a predisposition to influenza and consumption.

Various discharges from the human body, as well as from other animals suffering from any diseases caused by specific germ, will contain the active causative factor of those same diseases.

These germs remain alive for various lengths of time, depending upon various factors, such as the tendency of the germ to produce spores, these spores having a very much greater power to resist dessication than the vegetative form of the same germ; the size of the particle of dust that is harboring the germs, this having much to do with the length of time that it takes to dry up, the larger particles remaining moist for a much longer time, thus retaining the germs in the living state for a much longer time.

Dr. Eduardo Germano has made a classification of the bacteria, more particularly of the pathogenic or disease producing forms, the

basis of his classification depending on the power of resistance to drying of the various germs. He makes three groups:

First, those which cannot survive drying for more than a few hours, as typhoid fever and Asiatic cholera.

Second, those which can stand drying for a longer, but a somewhat limited period, as diphtheria and streptococci.

Third, those which can readily resist the drying for months, perhaps years, without losing their virulence, as tuberculosis, anthrax, tetanus, etc.

Diseases that may be, and without doubt are spread through the agency of street dust, include consumption and other forms of tuberculosis, smallpox, measles, scarlet fever, whooping cough, diphtheria and influenza.

While there has been nothing new brought out in this paper, it has been written with the purpose in view of calling the attention of engineers, particularly municipal engineers, to the seriousness of the problem in hand. Granting that there is much disease, perhaps much more than we realize, caused by street dust, it is the evident duty of the engineer to eliminate all factors in the streets and the vicinity of the streets that tend to increase dust, both organic and inorganic. This would include a study of the various kinds of pavements to determine which are the most dusty and the least dusty under all conditions; a study of the best methods of watering streets to keep the dust down to a minimum; the best methods of cleaning streets for the removal of all dust, and removing it in such a manner as not to create a nuisance; a study of the condition that will tend to decrease the awful smoke nuisance, not only prevalent in the larger cities, but even in the smaller ones; the matter of removal of household wastes, garbage, ashes, etc., without creating a nuisance and without increasing even temporarily the amount of dust in the streets.

And the engineer could also use his influence toward the enforcement of the law prohibiting public expectoration, one of the vilest of human habits, as well as one menacing the health of many citizens.

In conclusion, then, permit me to emphasize the fact that the matter of street dust in its relation to health is an important one. The inorganic lifeless particles injure the health as much, if not more, than the microbes and other living organisms. The latter must be considered, however, as one of the important disease producing factors in dust. The two working together make a strong combination against the health of our bodies. The engineer above all others is concerned with the problems connected with street dust, and the communities must look to him, first of all, for any improvements in street cleaning methods, construction of pavements, reduction of smoke and soot, in fact, all improvements tending to better the present extremely bad and unhealthful conditions.

SEVERANCE BURRAGE.

## Cheap Telephones in Sweden

THE telephone monopoly in this county, for the time being, has a cinch and can and does charge whatever it likes for telephone service. When our Government and our municipal officials wake up to the fact that this need not continue, inasmuch as the franchise granting power is within their province and that, therefore, they have the power to regulate the telephone rates, there will be some hope of relief. The growth of the independent telephone systems throughout the country has materially reduced the rate in some localities, but even these reduced rates do not compare favorably with the low rates in Sweden. The conditions described by Frank G. Carpenter, in the Chicago *Record-Herald* seem ideal. He said in part:

"How would you like a first-class telephone at $1 a month? That is what they have in Stockholm. There are two telephone companies there, one belonging to the government and the other owned by a syndicate of Germans. Neither company charges more than $10 a year per dwelling, and this charge includes a radius of forty miles about Stockholm. It gives you 400 conversations a year and for a few dollars more the service is unlimited. Business houses pay only $25; and some only $20. The government service covers all Sweden. It has 55,000 subscribers, of whom 9,500 are in Stockholm. The German service has 33,000 telephones, and both companies have public pay telephones on almost every street corner.

"I like the street telephones. They stand alone on the corners or in the parks looking like sentry boxes walled with glass. Each has slots for small coins and in each is printed the rates for Stockholm and all Sweden. You can have a five-minute talk with any one in Stockholm or within a radius of forty miles outside of it for two and one-half cents, or to any part of Sweden for seven cents.

"There are telephones in the restaurants, some of the tables having electric connection. Suppose you are eating there and want to send a message home or to ask a question of some one in another part of the country. All you do is to crook your finger and the waiter brings a telephone to your table and you talk away.

"I have a telephone in my room at the hotel, and this is the case with every guest here. The telephone has a switch so made that by turning it I have connection with the office and bell boy, and so that on reversing I am in connection with the central station, and can bring all Sweden and Norway to my ear at a moment's notice.

"The "hello girls" here are government officials, for the government runs the telephones. They are very polite and you don't have to ring more than once. The pronounce the word "hello" as though it were spelt "haloo," with the accent on the last syllable, and they never tell you the line is busy when it is not. At present all the wires in Stockholm are being placed in underground conduits, and altogether the lines are expensively constructed. Notwithstanding this the companies make money and pay dividends at a two and one-half cent. rate."

## A Trick of the Asphalt Trust

AT the time of the reorganization of the new asphalt trust, some months ago, our readers will remember that we called attention to the provisions of the new corporation, viz., that they permitted the trust to lay pavements of all kinds—asphalt, brick, wood, granite, Medina stone, bitulithic—and also to furnish or manufacture the materials necessary for their construction. We expressed the fear at the time that if the trust actually laid any other than asphalt pavements it would be to the detriment of the other kinds of pavements. Later, in Cleveland, the trust secured the contract for laying brick pavements and the brick manufacturers voiced the same feeling. Recently, the Barber Asphalt Company was awarded the contract for a brick pavement in Newark, N. J., and the experience of that city is told in an article appearing in the Newark *News* of November 11th, from which we quote freely, as it will be of interest to the readers of the MUNICIPAL JOURNAL AND ENGINEER:

"Sharp criticism of the manner in which Mt. Pleasant avenue has been paved was expressed by Jeremiah Demarest, who spoke on behalf of himself and several other residents of that thoroughfare, and by the commissioners themselves, at a meeting of the Street Committee of the Board of Works, yesterday afternoon (Nov. 10). Mr. Demarest said that the pavement was of the poorest quality, and Commissioner Ballard called it the worst brick paving ever laid in the city. President Vinson and Commissioners Eggers and Baumann also voiced their disapproval of the work, and the four officials stated positively that the final estimate would not be passed until the street had been placed in first-class condition. The commissioners spoke from personal knowledge.

"Although the paving was completed less than a month ago, on October 26, it is asserted, that in some places it has literally gone to pieces, and that here and there the roadway is in a worse state than that in streets over which there has been heavy traffic for eight or ten years. It is declared that the brick used differs little from the ordinary fire brick, and that only a small portion of it is of the kind called for in the specifications. It is also charged that the required concrete foundation was not laid to the depth specified, that the workmen were permitted to change the grade laid out, as they pleased, and that deliberate deception was practised on the inspectors. The Barber Asphalt Paving Company are the contractors.

"Mr. Demarest asserted that when the street was opened, the contractors discovered that underneath a thin layer of earth there was a

rich bed of sand, and that they carried it away by the cartload and applied it to their own use and filled in the cavities roughly with stones, in direct violation of a clause in the specifications. He also maintained that bulldozing tactics were used on the inspectors and said that he had seen a member of the paving firm, a young man, strike one of the inspectors in the face.

" 'I am prepared to make an affidavit to this,' he said, 'and can prove my assertion by a witness who saw the occurrence.'

"In reply, Commissioner Ballard, after referring to complaints which had been made by other residents, said:

" 'As to the justice of these there is no doubt, for we have visited the street and seen it for ourselves. If not the worst pavement in Newark, it is the worst brick paving ever laid in the city. Of all the poor pavements in the city it is the limit. Never have I seen a street in such poor condition, even on thoroughfares in use from two to eight years, and with heavy traffic at that, and this pavement, laid only a few weeks ago, is going to pieces with only light traffic over it.' "

## A Novel Plan for Municipal Betterment

*Editor,* MUNICIPAL JOURNAL AND ENGINEER:

ST. LOUIS, Mo., October 30, 1903.

The reason municipal government in the large cities of our country is a failure lies primarily with the legislative branch of the city government. The members of the legislative branch are selected by one element of the body politic—the political element.

The political element has fastened upon our cities the "spoils" system. Out of the "spoils" system has grown the "combine." The "combine" is a parasite on the body politic. Out of the combine has evolved the "boss" or agent, a man developing a fitness for that kind of work.

To remedy this evil a radical change is necessary in the form of city government. The city should get a charter from the state enabling it to conduct its affairs as a corporation along business lines and thus remove it from the domain of politics.

The legislative branch should consist of one house; the members of that house should be selected and elected by the different elements of the body politic; each element should select and elect three members. Municipal elections for the purpose of electing assemblymen should be held every four years. The body politic should be divided into the following elements: Doctors of Law, Doctors of Divinity, Doctors of Medicine, educational, transportation, commercial, manufacturing, financial, amusement, military, and labor through its federated unions.

The assembly should employ a mayor and an assistant mayor. It should employ all the heads of the executive departments. The executive heads of the deartments of the city government should hold office during fitness, with a pension provision upon retirement.

The executive heads should be men who are experts in their respective callings, with whom their callings is a life work. The mayor should be general manager of the corporation and the assistant mayor should be assistant general manager, both subject to the control and supervision of the assembly. The mayor should receive in cities of 300,000 or more, a salary of $15,000 a year; the assistant mayor $10,000 a year. The heads of the executive departments should receive from $5,000 to $8,000 per annum; the members of the assembly should receive not more than $3,000 per annum. A larger salary would have a tendency to make the man seek the office.

Civil service should prevail in all departments excepting day laborers. In case of death or resignation of a member of the assembly, his successor should be selected and elected by the fraternity or element to which he belonged. The assembly being composed of men representing different callings, which callings are inter-dependent upon each other, therefore, there will result conservative and intelligent action in the ethical, the commercial and industrial fields.

This plan removes the management of the city from the domain of politics and places it upon a business basis, clearly fixing the responsibility upon the assembly.

The present franchise laws and the way they are worked in our large cities is the root of the evil and must be radically changed in order to operate the above plan—no easy matter, as it calls for a change in our laws, but it can and must be brought about. Disraeli told the truth when he said municipal government in the United States was a failure. The most striking example afforded by any city in the country is shown by the two great upheavals that St. Louis has passed through in the last twenty-five years, which shows clearly that the cure for the disease does not lie in switching from one political party to the other, but the need of changing our methods of selecting and electing members of the assembly.

The advantage of selecting men for the municipal assembly by the element to which they belong is that they are chosen by their fellow workers in the same line of life work, so that the character and ability of the man is measured by parties who know him as well as man can know man. Men so chosen will consider it an honor to serve their city and they will command the respect of their fellow citizens. Under such an arrangement the office seeks the man, and not the man the office as in the spoils system. A most important provision.

This plan for the management of our cities is not unlike the plan upon which Glasgow and other large cities in England are managed. The legislative branch of the English cities consists of one house, composed of councilors and aldermen.

The progress of Glasgow as a city is an example of how much can be accomplished by intelligent action on the part of leading citizens, actuated by municipal patriotism and civic pride. The spoils system was as thoroughly fastened upon Glasgow when the reform movement commenced there as it is now upon many of our cities. That city is now, probably, the best governed city in the world. No city has had more difficult municipal problems to solve for its betterment than Glasgow. What has been done by patriotic citizens of Glasgow can be done in St. Louis, or any of our cities, if our patriotic citizens will persist in the work they are doing. What it has taken Glasgow sixty years to accomplish, we cannot do in six months or a year; but by profiting by the municipal problems worked out by Glasgow, Berlin and Paris, we can have model cities in eight or ten years by persistent hard work.

J. CHARLES CABANNE.

## Personalities

—Mr. Joseph L. Wickes, formerly assistant engineer in the City Engineer's Department of Baltimore, has been appointed Commissioner of Street Cleaning for that city.

—The new Council of Montgomery, Ala., has elected the following city officials: Mr. Ray Rushton, city engineer; Mr. C. P. Hardway, city clerk; Mr. R. S. Williams, city treasurer; Mr. A. H. Harrington, recorder.

—Mr. B. J. T. Jesup has been appointed City Engineer of Indianapolis by Mayor Holtzman.

—A coroner's jury sitting in the case of the death of Joseph O. Brown, formerly Recorder of Pittsburg, Pa., has decided that Mr. Brown was poisoned, and that the death certificate had been falsified. The relatives were exonerated from all connection with the crime.

—Mayor Carter Harrison, of Chicago, has proposed a scheme by which vice will be segregated in his city. He ordered that a list of landlords owning property on the levees be prepared, not only to show to the public the identity of the owners of the houses in these districts, but also to take the first move in a definitely planned segregation scheme.

—Mayor Jeffrey, of Columbus, O., blames the Municipal Code of Ohio for the way he is handicapped in running the Police Department. The division of authority between himself and the Board of Public Safety prevents efficient work of the Department.

—In regard to the granting of a franchise to the St. Paul Gas Company, Corporation Attorney Michael of that city has been contending for the provision that the mains, pipes and other street equipment should revert to the city at the expiration of the franchise in case the city does not purchase before that time.

—After weeks of investigation into the affairs of the city of

Memphis, Tenn., covering a period of five years, the report of the experts engaged in the work completely vindicates Mayor Williams and his administration from the charges of malfeasance which were brought by a citizen. Said citizen and the experts which he was authorized to hire, found no shortage in the accounts in any department.

—At the monthly meeting of the Franklin Institute of Philadelphia on November 18, Mr. W. F. Morse, president of the Morse-Boulger Destructor Company, New York, read a paper on the "Utilization and Disposal of Municipal Waste," describing the various methods and apparatus and illustrating his remarks with lantern slides.

—Mr. George A. Soper, Ph. D., of 29 Broadway, New York City, has finished his work at Ithaca, as typhoid fever expert for the New York State Department of Health, where he has been investigating the epidemic of that disease and directing the work of installation of better sanitary improvements. He is now at liberty to take up sanitary investigations and devise plans for water supply and filtration, sewage prification, garbage disposal, the work of suppressing infectious diseases, etc.

—In his last annual message to the Council of Montgomery, Ala., Mayor J. B. Smith reviews the improvements that have been accomplished by his administration, and remarked concerning the water supply: "considering the intimate relations of water supply to the life and health of the community, it appears to me almost criminal on the part of municipalities to permit it to be furnished by private parties, interested only in their private gains."

—The second inaugural address of Mayor Chambliss, of Chattanooga Tenn., reviewed the work of the administration. He complimented the different departments on the good work they had done, mentioning especially the accounting department and the Boards of Public Works and Safety. He said that the insurance rates were too high for the fire protection afforded, and urged that no more improvement be made in this direction until the rates were lowered. He suggested a number of improvements in the public schools, and recommended that more buildings be erected to accommodate the increasing number of children. He endorsed the anti-spitting ordinance which was not passed by the Council, but which it will probably be introduced again.

—The announcement of the marriage of Mayor J. Adger Smyth, of Charleston, S. C., to Miss Ella Calvert Campbell, of Washington, D. C., has been made. The ceremony took place at the home of the bride, on November 17.

—One vote elected Mr. George S. Licht, a Democrat, for mayor of Geneva, N. Y., over Mr. Albert H. Henderson, the vote being 1,294 for Licht and 1,293 for Henderson.

—Mayor Schmitz, of San Francisco, was re-elected by 6,000 plurality over his two opponents. It is claimed that the labor vote contributed largely to his victory, inasmuch as he was willing to use his power as Mayor to aid the workmen in any strike that might occur.

—Hon. Denis Mulvihill, of Bridgeport, Conn., and Hon. Stephen Charters, of Ansonia, Conn., were returned to the mayors' chairs in those two cities.

—The following mayors were elected in the cities of New York State on November 4: Rochester, Mr. James G. Cutler, Republican; Syracuse, Mr. Alan C. Forbes, Republican; Rome, Dr. Thomas G. Nock, Democrat; Oswego, Dr. James E. Mansfield, Democrat; Watertown, Mr. Charles D. Bingham, Republican; Amsterdam, Mr. Robert N. Clark, Democrat; Binghamton, Mayor S. L. Smith, Republican, re-elected; Oneida, Mr. George L. Scheifield, Republican; Gloversville, Dr. Eugene Beach, Republican; Johnstown, Mr. James L Northrup, Democrat; Fulton, Mr. Marvin A. Thompson, Democrat; Utica, Mayor Charles A. Talcott, Democrat, re-elected; Little Falls, Dr. Edgar H. Douglas, Republican; Kingston, Mr. Morris Block, Democrat; Newburg, Mayor J. D. Wilson, Republican, re-elected; Schenectady, Mr. Frederick F. Eisenmenger, Democrat; Dunkirk, Mr. Charles J. Wirtner; Plattsburg, Mr. W. J. McCaffrey, Republican; Yonkers, Mr. John E. Andrus, Republican; Troy, Mr. Joseph F. Hogan, Democrat.

—New Jersey cities elected the following mayors: Jersey City, Mayor Mark M. Fagan, Republican, re-elected; Trenton, Mayor Frank S. Katzenbach, Democrat, re-elected; Passaic, Mr. David Greenlie, Republican; Paterson, Mr. William H. Belcher, Republican; Hoboken, Mayor Adolph Lankering, Democrat, re-elected; Bayonne, Mr. Thomas Brady, Democrat.

### Motor Cars Cut Up Roads

It is reported from Birmingham, Eng., that the county surveyor of Surrey has discovered a curious effect that the motor-car traffic has on dry roads. It has been observed that the large rubber tires separate the small metal from the large and extract it so that it is not an uncommon thing after a dry day to find long stretches of road, where the surface had been perfect in the morning, covered with fine, sharp grit which had been sucked up during the day by the rubber tires. Heavy motors going at a rapid rate tear up the gravel roads. As the use of the motor car is growing, it will be necessary to secure a road surface that will not be so easily damaged by them and the authorities are already studying the question in this section.

### Automobile Regulations in Cities

The regulations for the government of automobiles in several cities of this country are, in some respects, very similar, while in others they differ widely. In Philadelphia, the ordinance provides that, before an automobile may be operated on the street, a certificate must be secured from the Bureau of Boiler Inspection showing that the machine is safe. No oil or other substance is permitted to drop from the machine and each auto must be supplied with a brake, bell or horn, and with devices necessary to prevent the escape of steam, and the making of unnecessary noise. A license fee of $2 for the first and $1 for succeeding years must be paid. In thickly settled sections the speed limit is seven miles an hour and in other parts eight. Lamps must be carried in front and rear at night.

The Chicago law requires each operator to be licensed and pay a fee of $3 for the first and $1 for subsequent years. The speed is limited to eight miles, and each machine must have a bell of not more than four inches in diameter to be sounded at crossings. There must be brakes and a lamp at night, and no part of the machinery must be left running when the machine stands. Each machine must carry indentification numbers five inches high.

Clevelanders, owning autos, must register their machines with the city clerk for a $1 fee, and place aluminum figures four inches high on the rear of the machine. Lamps, bells or horns must be carried and the speed is limited to seven and fifteen miles according to locality, and machines must be stopped when frightened horses are approached.

In Cincinnati, the licensing is similar to Cleveland, but the fee is $3 and 50 cents for each initial of the owner to be placed on the auto. The license must be renewed yearly at $3, and will not be issued to those under sixteen years. The speed is limited to seven and fifteen miles and drivers must stop for frightened horses.

The Milwaukee law requires that autos shall not be operated faster than four miles an hour at crossings and around corners, and not to exceed eight miles in other places. Each machine must have a bell to be sounded at crossings and must have brakes.

St. Louis levies an annual tax of $10 on owners of autos, and autos must not be driven at a rate of speed greater than eight miles an hour, and in parks the limit is six miles.

Toledo requires owners of autos to pay $4 a year, and to display a three-inch number on each machine.

The regulations in Detroit, Mich., fixed the rate of speed at eight miles per hour within a distance of three-fourths of a mile of city hall, and outside of that limit the rate is twelve miles per hour. No one under sixteen years of age shall run an automobile. Owners must register with license collector their names and residences, and a description of the machine. The license collector will provide aluminum figures four inches high and three inches wide, and collect as a fee the sum of $1. Visitors may keep automobiles in the city for two days without complying with the foregoing regulations.

# NEWS AND PRACTICE AMONG THE CITIES

## New Orleans Not to Have Municipal Light Plant—Milwaukee to Abolish Smoke Nuisance—City's Right to Control Its Streets—Telephone Rates Adjusted

### High Sign Boards Prohibited

THE erection of sign boards in the city of Newark, N. J., is now governed by an ordinance which provides that no sign boards of wood or metal shall be more than ten feet above the surface of the ground. No sign may be attached to another so that the combined heights are over ten feet. A permit must be obtained from the Superintendent of Buildings and a fee of $1 paid before any sign may be erected. All signs must be properly braced and constructed, and must be so maintained. The Superintendent of Buildings shall have the power of ordering the repair or removal of all signs, bill boards or fences that may, in his opinion, become dangerous or are erected contrary to this ordinance, and he may remove the same after notice. Within twenty-four hours of notice, or a period of five days, according to the urgency of the case, if the sign or board be not removed, the said Superintendent shall cause it to be done and charge the expense to the owner of said sign, bill board or fence.

### Another Trial at Oiling Roads

THE first attempt to use oil on country roads in the vicinity of Oakland, Cal., was made recently by Supervisor Rowe in Alameda County. The road in question was very steep and could not be watered readily without carrying the water from the bottom to the top of the hill. The road was very dusty and much complaint had been heard from the farmers that used it. A contract was made with a firm to oil the road, but, as the firm did not live up to its contract, the Supervisor decided to do the work himself. He secured a special sprinkler, which was attached to an ordinary watering cart. The road is to be sufficiently drained and oiled again before the winter sets in. The oil was applied cold and has entirely laid the dust, but to secure a semi-bituminous roadway, as in Golden Gate Park, it is necessary to put the oil on hot. The farmers are satisfied with the result because they can draw their hay into town without having it covered with dust, and thus get more for their product.

### Better Meat Inspection in Saginaw

AN ordinance recently proposed by the Board of Health of Saginaw, Mich., provided for better meat inspection and makes it necessary for each dealer to secure a license from the Board before selling meat. Before a license is granted, however, an inspector must report on the construction, sanitary condition and cleanliness of the applicant's premises and the meat he sells. A license may be suspended or revoked if all conditions of the ordinance are not complied with. The inspectors must report at once to the Council and City Attorney all violations of the ordinance, and once a month to the Board of Health. All animals must be slaughtered in a licensed house and the inspector must examine all animals to be slaughtered on the hoof. The ordinance makes provision for identifying the animal after slaughtering, and also for the stamping of good meat. Whole animals unfit for food must be immediately killed and destroyed, with the consent of the owner. If he does not consent, a careful description of the animal must be taken and it will be unlawful to use said animal for food. Contagious diseases are also provided for, but the ordinance does not apply to poultry, game, or smoked, pickled, salted or canned meats.

Houses used for slaughter must be properly designed for that purpose, an abundant supply of water must be provided, and provision made for cleanliness, cooling, storage rooms, etc. Offal and refuse must be removed the day of slaughtering, and suitable rendering tanks, apart from the cooling and storage rooms, must be provided. The rules and regulations of the United States Government in the inspection of animals are to be taken as the standard. All meat brought into the city must be stamped by the inspectors before it may be sold.

### The Year's Work in Montgomery

DURING the past year 1,512.94 feet of storm sewers were built in Montgomery, Ala., according to the report of City Engineer D. W. Ford. There were also laid 686.9 feet of sanitary sewers and 377.43 feet of brick surface sewers. Only 1,035 square yards of brick paving were laid with 1,117.13 linear feet of curbing, although a number of streets were graded. The city has now 22,133 miles of storm water sewers, 38,977 miles of sanitary sewers, 21,767 miles of surface sewers, 11,617 miles of paving, 32,563 miles of curbing, and 19,871 miles of sidewalks.

### Work of Butte's City Engineer

DURING the year ending May, 1903, there were 6,379 feet of sanitary sewers constructed in the city of Butte, Mont., at a total cost of $10,048.30. The total cost of laying storm sewers amounted to $7,147.10. For this sum 9,682 feet of brick and storm culverts and 9,365 of ten to thirty-inch cement pipes were laid. Flushing of sewers and cleaning of catch basins were carried on once a month and no trouble has arisen from stoppages in either.

City Engineer F. C. Bickenbach reports that two improvement districts were paved during the year, making a total of 2.53 miles of paved streets and alleys in the city. Sprinkling was done by the city at the sum of eight to twelve cents a foot front which was assessed upon the property. The cost of running his department amounted to $4,061.17 for the year, leaving a balance of nearly $1,000 over the appropriation.

### No Municipal Lighting Plant for New Orleans

THE hopes of the advocates of a municipal electric lighting plant for New Orleans, La., were dashed to the ground when the Council of that city rejected the bid of a New York electrical company to erect the plant and ordered the preparations of plans and specifications for bids for a ten-year contract to light the city. City Engineer W. J. Hardee and City Electrician Foster Olroyd had made reports on the cost of constructing a municipal plant, and what it would cost to maintain and operate it and, in response to invitations for bids, several propositions were made to the Council, two of them being worthy of consideration. The Colonial Electric Company, of New York, offered to build and turn over to the city an electric plant, in every way adequate to the needs, for the sum of $1,249,998 to be paid, with interest, in ten-year installments. Estimates for operation placed the cost at $116,000 a year. Inasmuch as the city was in position to pay $225,000 a year for lighting, this sum would pay for operating, etc., which would amount in all to $121,000, and leave $104,000 for paying the principal and interest. The yearly interest and other charges would place the annual expenditures at $150,000, to which must be added the depreciation at 5 per cent., the loss of taxes and an amount for construction supervision. The sum total of these items were placed at $220,669.23 a year.

The New Orleans Railways Company, which now lights the city, offered to furnish 338 arc lights in the underground district at $92.50 each, 2,289 lamps in the overhead district at $77.50 each per year, or a total of $208,662.50. To this must be added $20,248.60 for incandescent service or a grand total of $229,006.10. Comparing this price with that for which the city could install and operate its own plant, a difference of $8,336.87 remains in favor of the city plant. At the end of ten years under the municipal ownership plan the city would have received all the light it needed, and would have paid its indebtedness and had an up to date electric lighting plant. Under the contract system the city most pay at the end of ten years a larger amount than it would cost to install the municipal plant, and at the end of that period have nothing to show for it.

**Wants Right to Control Its Streets**

THE city of Montreal, Can., has been contending for the right to control its own streets, and the Council will use every effort to induce the Parliament to pass legislation favoring municipal ownership. The Senate recently passed two amendments to the Railway Act in favor of home rule and the Council desires that the other branch of the government do likewise. A clause had been inserted in this bill giving the Railway Committee of the government the power to control from a federal standpoint any line or lines that might cross a regular or federal railway. This would place nearly all street railways in cities under federal control. The Senate, recognizing the danger of this, passed an amendment which would neutralize the effect of some of this act. Another dangerous clause which the Montreal Council wished to be changed, was the right granted companies to apply to the Legislature for power to erect poles on city streets when the cities involved had refused the right. The Senate desires the House to adopt an amendment which would provide that companies must obtain the consent of the municipalities before they could sell or distribute light, heat or power. Thus they would come under municipal control.

**New Garbage Ordinance in Dayton**

THE council of Dayton, O., has passed an ordinance for the regulation of the collection and disposal of garbage and dead animals and permitting the Board of Public Service to make contract for the same. Citizens must provide portable and water tight vessels for holding the garbage and these must be fitted with tight covers to be removed only when necessary. They must be kept so as to be accessible and shall not be kept on the streets, walks or alleys. Only regular collectors are to collect these vessels and no one may interfere with them. Garbage is to include the refuse of animal, vegetable matter or fruit. Ashes, tin cans, refuse or waste of any other kind must not be placed in these cans.

A contract for collecting and disposing of garbage may be made for a period of ten years. The work must be done in a sanitary manner, free from nuisance, and if the garbage be disposed of within the city limits or three miles thereof, the same shall be done by reduction or cremation in such a manner that no gases or odors shall be permitted to escape and a temperature must be maintained at such a degree that the contents of the garbage tanks, when exposed to the air, shall be free from offensive odors and be sterile. A contract for the removal of all dead animals may be made by the city and all such dead animals must be removed from the city within ten hours after a report of the same is made by the Board of Health or Board of Public Service. No one but an authorized person shall remove any garbage or dead animal. Those making a contract with the city for garbage must agree to receive night soil from the collectors thereof at the same place and time that the garbage is received and to dispose of the same in a similar manner. They shall charge collectors of night soil for disposing of same the same rate as is charged for garbage disposal, and there is to be no discrimination between collectors. The city is to pay nothing for disposal of night soil. A penalty of $50 is to be attached to all violations of this ordinance.

**Telephone Rates Reduced and Increased**

IT is a surprising thing for a telephone company to reduce its rates when the competition is not great, but the Central New York Telephone Company has reduced its rates on certain classes of lines, and has practically abolished the measured or limited plan for residences. The purpose of the reduction is to increase the number of residence subscriptions and the completion of an extensive underground cable system has placed the company in a position to handle this class of business in almost any amount. At present the unlimited local service for special residence lines is $33 a year and duplex lines $18, formerly it was $45 and $33 respectively for these services.

The Council of Duluth, Minn., recently passed an ordinance permitting the Zenith Telephone Company to increase its rates on a sliding scale, and, under the amended ordinance, the rates will be as follows:

While the number of telephones in use is 1,000 or less, for telephones in places of business, $30; for residences, $20.

While the number of telephones in use is between 1,000 and 2,500, for telephones in places of business with one party on a line, $36; with more than one party, $30; for telephones in residences with one party on a line, $24; with more than one party, $20.

While the number of telephones in use is between 2,500 and 3,000, for telephones in places of business with one party on a line, $40; with more than one party, $33; for telephones in residences with one party on a line, $24; with more than one party, $20.

While the number of telephones in use is between 3,000 and 3,500, for telephones in places of business with one party on a line, $42; with more than one party, $36; for telephones in residences with one party on a line, $28; with more than one party, $22.

While the number of telephones in use is over 3,500, for telephones in places of business with one party on a line, $48; with more than one party, $36; for telephones in residences with one party on a line, $30; with more than one party, $24.

Provided, however, if any installment of rent for any telephone is not paid within fifteen days after the same becomes due, fifty cents may be added to the bill by the person, company or corporation operating hereunder.

**Milwaukee to Be Rid of Smoke Nuisance**

THE Council of Milwaukee, Wis., has been considering the passage of an ordinance that is designed to abolish the smoke nuisance. It was modeled after the Chicago law, and provides for a board under which a smoke inspector is to work. A salary of $3,000 is attached to the office of the inspector, who must be a mechanical engineer of five years' practical experience, and who will hold office for three years. The board is to act promptly on the reports of the inspector, issue such notices as the ordinance requires and direct the commencement of actions for the suppression of smoke. The ordinance prohibits the omission of black or dense smoke from any chimney, each day of the continuance of the nuisance being a separate offense punishable by a fine of $50, or imprisonment for sixty days. Upon report of the inspector, the board must inspect the premises complained of and, if the report be verified, the owner must be notified to abate the nuisance within thirty days. A bond of $5,000 must be furnished by the inspector for faithful performance of his duties. No special kind of smoke consumer is implied in the ordinance, and manufacturers and others may install any kind that will prevent the issuance of smoke. In speaking of the ordinance, Mayor Rose is quoted as saying:

"The ordinance which has just been introduced will solve the problem, and if it is passed it will be enforced. If the Council fail to pass it, I will find some other means to stop the nuisance. We can have those chimneys that emit dense clouds of smoke declared a nuisance and later can enjoin the owners from using them until the evil is remedied. I have conferred with the city attorney on this subject and he has promised to support me, and I mean to see that the nuisance is stopped.

"There is no intention on the part of the city to saddle an ordinace on the business men that will prove a hardship. What we are trying to accomplish is nothing unreasonable. There are appliances that save fuel and do away with the smoke and I do not think that it can be considered a hardship to demand that the manufacturer put in a consumer when in the end he will save on his fuel bill. Besides this, his neighbors are entitled to some consideration. The manufacturer has no right to injure another's property, or to allow soot to be scattered broadcast. There are several plants in the city that have solved the problem. Their chimneys no longer emit clouds of smoke. Smoke consumers are no longer an experiment; their entire practicability has been demonstrated.

"As soon as the ordinance is passed, I shall go a step further. I shall ask the Common Council to so amend the building laws that in future every person erecting a building other than a dwelling house will be required to equip the structure with a smoke consuming appliance, which, before being installed must be approved by the board and the inspector."

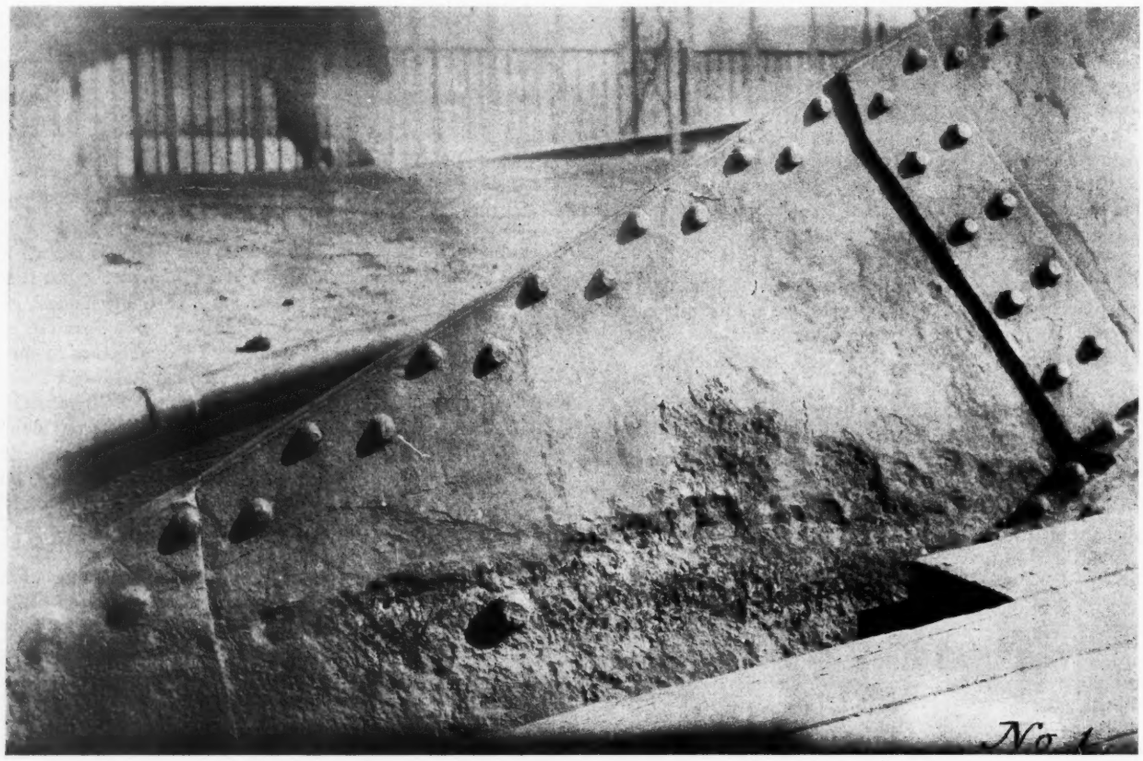
## Electrolysis in Providence

The question of electrolysis of the water mains has become a serious one in many American cities. As each city awakes to the damage that is being wrought to its water mains by escaping electric currents from the trolleys, tests are made to locate the trouble and to fix upon the remedy. In all cases it is usually suggested that the double trolley system would effectually prevent any further damage, yet in but three cities is this system in operation—New York, Cincinnati and Washington. Providence, R. I., has had its share of electrolitic trouble and the last report of City Engineer Otis F. Clapp states that on one street, six six-inch water mains were taken out and found to be greatly decomposed. A little later three more were dug up and one was found to be entirely eaten through. These pipes were in ground moistened by tide-water and the presence of the salt water accounts for the rapidity with which the electric current did its work. The iron bolts of a water meter in the vicinity of the pipes were eaten off and it was necessary to replace them with bolts of composition. In another instance, the bolts of a meter were destroyed and two lead service pipes were badly eaten away. In all of these cases the salt water kept the ground moist.

In May, 1902, Mr. A. A. Knudson, of New York, was engaged to go over the same territory covered by him in his investigations of 1900, regarding the results of electrolysis. His report on his work showed that conditions had improved during the two years. It showed that, wherever the railway company had laid new rails and made other improvements of a similar nature, the conditions were much improved. A test station was installed at the City Hall and tests made to show the difference of potential between the tracks and the water mains. At this point a number of railway lines converge and thus it was a good place to test for the average conditions. Of the eighteen lines on which tests were made, Mr. Knudson found that fourteen showed a decrease in the positive readings of the voltmeter over those taken in 1900, while twelve lines showed an increase of the negative readings. This proves that some improvement in conditions over those of the previous period had been made. That shown on the positive side is, in the opinion of Mr. Knudson, due to the improvement in the tracks. Lines not improved usually show high negative readings. Inasmuch as the section where the tests were made represents the most perfectly bonded tracks in the city, it proves that there is no possibility of preventing the damage to the water mains in any part of the city; as long as the single trolley system is in use these effects will prevail.

Mr. Knudson is of the opinion that the time is coming when the trolley lines of the different cities will be compelled to insulate their lines from the earth, but at present it will be necessary for the railway company to attend to its tracks at places where the conditions are especially bad.

Not only are the water mains being damaged by the stray electric current, but even the bridge trusses in places have been eaten. The accompanying illustrations show where the ends of spans have been pitted, the damage having gone on for several years but faster of late. Readings with the voltmeter show a current from the river to the iron piers and truss of the bridge and from them to the soil at the end of the bridge. The corrosion at the other corners of the bridge than that shown in the illustrations is slight although perfectly visible. The parts that were corroded were reinforced to prevent their giving way. It is unusual that a city bridge should be attacked thus by the electric current, although the damage to underground pipes is wellnigh universal wherever the single trolley system prevails. All experts are agreed that the double or underground trolley system seems the only practical way of preventing destruction to the underground services.



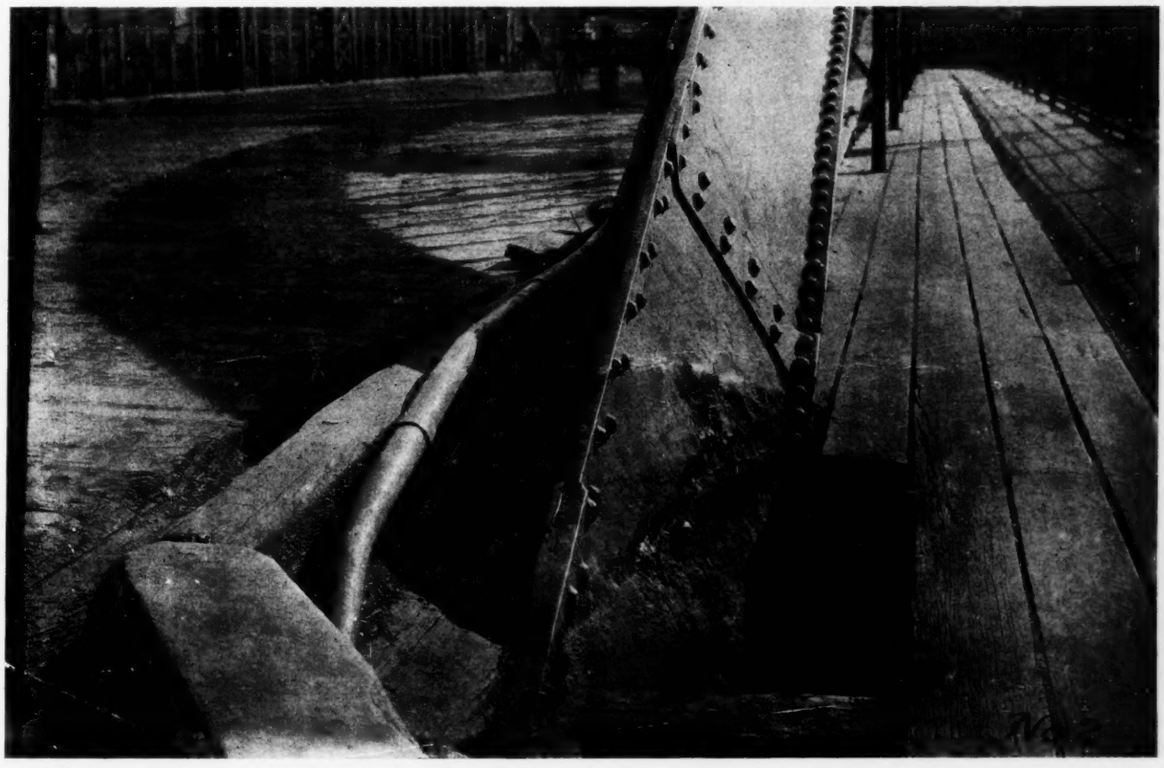

SIDE VIEW OF TRUSS ARCH, POINT ST. BRIDGE, PROVIDENCE, R. I.—DAMAGED BY ELECTROLYSIS

### Expert Reports on the Electrolysis of Water Mains

As stated in the August issue of The Municipal Journal, the city of Richmond, Va., was to employ an expert to investigate the condition of the water mains with regard to the damage wrought in them by electrolysis. The services of Mr. Dabney H. Maury, C. E., of Peoria, Ill., were secured and his report has been published. The depreciation is estimated at 22.2 per cent., or $170,224, and this percentage was obtained on the relation which the depth of the deepest pitting bears to the actual thickness of the pipes at the openings where tests were made. There were fifty street openings made and 101 lines of pipe exposed. No allowance was made for pittings

of the interiors of the pipes. No examination was made of service pipes. Superintendent of Water Works C. E. Bolling, reported to Mr. Maury that over 200 out of 15,000 extra heavy lead service pipes have already given way because of the electrolitic action in them.

In addition, the damage to the mains themselves, much loss has occurred because of waste of water and injury to pavements, foundations, etc., caused by the escaping water. Futhermore, there is the danger to life and the threatened loss from fire due to failure of the water supply at a critical moment. The voltmeter showed unusually low differences of potential compared with what is found in other cities, and they are also lower than those found several years ago. While the carefulness with which the street railway companies have been attending to the perfect bonding of rails and the improvement of return feeders has contributed to the reduction in the damage from electrolysis, Mr. Maury is of the opinion that little further reduction can be looked for from this character of work. The present conditions are serious and the damage continually increasing, consequently Mr. Maury recommends that the City Council "adopt such reasonable measures as may result in securing the change from the single to the double trolley system in the shortest possible time."



FOOT OF TRUSS ARCH—END VIEW

## Success of Municipal Insurance Scheme

After a year's existence, the "Municipal Mutual Insurance, Ltd.," is in a vigorous condition, according to latest reports. Despite the predictions to the contrary, on the part of parties interested in private insurance work, the company has made a profit after all expenses were paid. The initial expenses were exceptionally heavy, for they included registration, counsel's fees, charges for underwriters, etc. The profit is large enough to provide a rebate of 10 per cent., after providing for the unexpired period of the risks and laying aside a normal ratio of loss for the remainder of the year. The association of municipalities, making up this company, conducts its business on the same lines as do other insurance companies and, to-day, is in a very strong position. It has insured one building for $750,000. Inasmuch as this company is an insurance company it is as safe as any of the bodies which never bear all of the loss but underwrite to a great extent. The Municipal Mutual Insurance, Ltd., never retains more than $25,000 on any one risk, but has made arrangements with underwriting companies by means of which in case of the whole loss of any risk, would cause a loss of a sum equal to less than two years' premium.

Eighteen municipal bodies now subscribe to this company and most of them are included within the limits of London. During the past year there was no loss by fire, but the company is ready, in such an event, to prove that it is ready to meet all demands. The different classes of property covered by this company is large and includes municipal buildings of all kinds, sewage works, destructor plants, household goods, private work shops, machinery, hospitals, chapels and cemeteries, private dwellings, farms, farm produce and buildings, horses, harness, stables, and a lot of miscellaneous objects. The company also acts as agent for employers' liability, boiler, fidelity guarantee, accident, burglary, plate-glass, etc.

The company was formed as a compromise between the habit of not insuring municipal buildings and the other extreme of paying the exorbitant rates exacted by the fire insurance companies which were much larger than the real risk from fire in the municipal buildings. It is but another instance of the way municipal ownership is being forced on municipalities by the extravagant charges of private corporations. In many instances municipal ownership would not be thought of if the greed of the private concerns did not compel the cities to defend themselves in the only way that seems possible.

This municipal insurance association is growing and its success will attract the attention of other municipalities not included in its list and other companies of like nature will be formed. The 10 per cent. profit will be used to provide a reserve fund so that a larger amount of risk may be carried and a larger profit earned. The great care and good business management displayed by the authorities in charge of the company's affairs has assured the success of this unique venture and will provide the proper encouragement for other municipalities. The position of the company is now absolutely secure. The courage of those municipalities that stood by the scheme in the face of all the pressure that was brought to bear by interested parties and

which caused some of the municipalities to withdraw from the enterprise, is to be commended. Had these faint hearted communities stayed with the others it is estimated that nearly 33 per cent. would have been the profit at the end of the year. Now that the scheme is secure they will, no doubt, want to join in it and secure the reward.

It has been proved that the loss in the case of municipal property does not exceed 8 cents on the $500, although the private companies have been charging from 32 cents to $2.50. Of course, the private companies are attempting to block the municipal scheme by cutting rates only to put them up again when they have succeeded in causing the municipal company to go out of business. It is probable that the municipalities will not be fooled by any such move.

## Annual Meeting of Health Association

The thirty-first annual meeting of the American Public Health Association took place in Washington, D. C., October 26-30. Gen. George M. Sternberg, U. S. A., welcomed the delegates. He sketched the history of the association and told of the noble work that was being done by it on behalf of the public health. In speaking of the conditions in Washington he stated that a law for the condemnation of unsanitary houses was needed. Dr. Walter S. Wyman, president of the Association, responded. Dr. D. E. Salmon, chief of the Bureau of Animal Industry of the Department of Agriculture, read a paper on the diseases of animals in their relation to food. Measures should be taken in every municipality in the country, he said, to prevent the spread of tuberculosis in animals and the source of the milk supply should be carefully attended to to prevent the infection of children. Other members did not agree with Dr. Salmon and the paper was well discussed. Dr. J. N. Hurty, secretary of the State Board of Health of Indiana, read a paper on the transportation of persons sick with communicable diseases. He is opposed to allowing sick persons to travel with the healthy and pointed out the dangers attending the carrying of convalescing typhoid patients. Dr. Juan Brena, of Zacatecas, Mexico, told of the car sanitation in his country.

At the evening session the delegates were extended a hearty welcome on behalf of the city of Washington by Commissioner Macfarland, during which he explained what had been accomplished in Washington towards the preventing expectoration in public places. Dr. Wyman then delivered his annual address. He pointed out the similarity between unsanitary conditions and political corruption, claiming that better progress would be made if one highly important element of municipal reform was seized upon at a time and all efforts made to concentrate on it the energies of all good citizens. Moral reforms would more easily follow better sanitation. Whenever a charter is granted to a village or city, Dr. Wyman believes that assurances of proper sanitation should first be given the legislature. At the afternoon session the general subject of car ventilation was discussed, the consensus of opinion being that the air in sleeping cars was not good and the cleanliness of the bedding was not carefully attended to. The report of the Committee on Cause and Prevention of Infant Mortality was read by Dr. Henry Mitchell, chairman of the State Board of Health, Asbury Park, N. J.

At the morning session of the second day the report of the executive committee was read by the secretary, Dr. Charles O. Probst, of Columbus, O. Two resolutions were recommended by the committee, viz.: The commendation of the aims and objects of the American congress on tuberculosis that is to meet in April, 1905, and the recommendation that the boards of health of all state, municipalities and provinces send delegates to the congress. Both resolutions were unanimously adopted. Dr. M. P. Ravenal, of Philadelphia, then read a paper on tuberculosis containing the results of his own investigations. Mr. Rudolph Hering, of New York, read a report from the Committee on the Disposal of Garbage. The report covered all phases of the question and gave the results of long experience as to the best methods of disposal. At the afternoon session considerable discussion on this subject took place. "Purification of the Water Supply" was the subject of a paper presented by Marshall Layton, of the Geological Survey, in which he stated that the filtration of water in America was no longer in the experimental stage, but that a material reduction of the danger from typhoid was certain to attend a properly built and operated water filter.

The canteen question was the subject for discussion at the morning session of the third day. Dr. George M. Kober, of Washington, read a paper on the subject. The speaker considered the question, all its bearings, and concluded that the abolition of the canteen must be deplored by all interested in the prevention of physical and moral diseases. In the afternoon the delegates discussed the bubonic plague, placing the blame for its dissemination on the rats, and Dr. Wyman was of the opinion that an international agreement should be made for the purpose of having all vessels on arrival at any port fumigated to kill rats on board. Other subjects considered were: "Disinfection and Disinfectants" and the "Experimental Study of Hydrocianic Acid as an Insecticide."

The election of officers took place at the last session of the Association. Dr. Carlos J. Finley, of Havana, was made president. The other officers elected were: First vice-president, Dr. J. R. Monjaras, City of Mexico, Mexico; second vice-president, Dr. William C. Woodward, health officer of the District of Columbia; secretary, Dr. Charles O. Probst, of Columbus, Ohio; treasurer, Dr. Frank W. Wright. Executive Committee, Dr. A. H. Doty, of New York; Dr. John R. Leal, of Paterson, N. J.; Prof. F. C. Robinson, of Bowdoin College.

Havana was selected as the next place of meeting. The Association passed a resolution recommending the re-establishment of the army canteen. Several papers of a technical character were read before the meeting adjourned.

## Mobile to Sell Street Railway Franchise

An ordinance has been approved recently by the Council of Mobile, Ala., providing for the sale of a franchise for building and maintaining of a street railway system in the city. The main provisions of the ordinance are as follows:

The railway shall be of the overhead trolley system; construction shall be under the supervision of the mayor and common council; all work shall be of the best; speed of cars shall be not less than six miles an hour; nor more than fifteen miles; three cars shall constitute the maximum train; comfortable stations shall be erected at all transfer points if deemed a necessity by the city engineers.

All streets used by the company shall be restored to their former condition at the expense of the company. If the city decides upon paving any street at present unpaved, the company shall pay for all that paving between its tracks, and for eighteen inches on either side. The company shall, at its own expense, put in all drains and culverts that shall be necessary along its route and shall maintain them and the streets in good condition. If any portion of the tracks of the company shall be removed from the streets, or any portion of any street, without the consent of the city engineer, or mayor and common council, the tracks may all be removed at the discretion of the council and mayor from those streets where the service is partially weakened, all at the expense of the company. For any failure for a period of sixty days to comply with the requirements of the ordinance, the city shall have the right to revoke the franchise without loss to the city.

Fare shall be 5 cents for adults, 3 cents for all children not over twelve years of age, if fare is paid and 2½ cents if tickets are purchased; all school children are entitled to the children's rate.

The city reserves its right at any time to remove the tracks of the company when necessary to lay sewer or other mains, or to do other necessary work. Before the construction of the work is begun, the successful bidder for the franchise must file a bond for $10,000 to indemnify the city against possible loss because of suit for damages resulting from the construction of the railway. The franchise shall be for thirty years. The successful bidder shall agree to pay at least 1 per cent. of the gross receipts for the first five years of the life of the franchise, 1½ for the next five years, 2 per cent. for the succeeding ten years, and 3 per cent. for the last ten years. All bids shall be accompanied by a bond for $30,000, to be forfeited if the work of building the street railway be not begun within six months of the date of approval of the ordinance, and if the company fail to prosecute the work with due diligence, completing it within two years from time of commencement.

## Chicago's Proposed Railway Ordinance

After several years of complaint and discussion, an ordinance regulating one of the street railways of Chicago has been drawn by representatives of the city and company involved, and will probably be adopted. Inasmuch as the Chicago City Railway Company must equip anew certain parts of its lines and inasmuch as the city desires to be in a position to take over the lines of the Company when it is in a position to do so, this new ordinance is proposed. Its provisions are numerous, but the most important are as follows:

The Company must construct a new power plant and operate all its lines by electricity and, in downtown sections, by underground trolley All the material used on its lines must be of the best. The city shall have the right to use the poles of the Company for its signal wires and all transmission and feeder wires carrying a current of more than 1,000 volts must be placed underground within the city limits. All work of construction and repair must be under the supervision and subject to the approval of the commissioner of public works. On all streets paved with permanent pavements the rails shall be of the "Trilby" pattern, weighing not less than 100 pounds per yard; the girder rail may be laid on streets not paved. Granite blocks must be used between the rails on all streets where the existing pavement is no longer serviceable or where the rest of the street is being paved, the size and manner of laying these blocks being set forth in the ordinance.

All cars hereafter put in service must be of the most approved pattern, and be equipped with vestibules, electric bells, approved fenders and must not have runboards along the sides, but be supplied with center aisles. Two sets of brakes must be used and each car must be properly supplied with signs.

If it seem best to have the whole width of the streets, on which tracks are laid, swept and sprinkled, or to have the garbage, sweepings or other refuse removed by means of cars at night, the Company must perform the service for a reasonable compensation.

No more free passes are to be given except to city detectives, but all policemen and firemen in uniform shall ride free. Fares are to be 5 cents for adults and 3 cents for children between seven and twelve years of age and such fares shall entitle passengers to a free transfer to any other line of the Company. Transfers shall be issued on other transfers, but the general direction of the passenger is not to be changed.

The Company shall not sell or transfer its rights under this ordinance except by mortgage or deed of trust for the purpose of securing funds for necessary improvements nor shall it directly or indirectly consolidate with any company without the consent of the city. No mortgage shall be made for longer than twenty years from date so that, at the expiration of this ordinance, the Company may be able to transfer to the city all its property free and clear. A bond of $100,000 must be filed with the city to save harmless the city from any damages, etc., that may be obtained against it by reason of this ordinance. The books of the Company must be open to the city comptroller at all times and a yearly report must be made to the city by the Company.

At the expiration of the ordinance the city shall have the right to buy the property of the Company at its fair cash value exclusive of earning power and franchise value. A year's notice shall be given the Company of such intention and the price shall be fixed upon by an appraiser selected by the city, one by the Company and a third by these two. Notice by the city of intention to purchase shall constitute a contract to buy the street railway at the value appraised, or to require the city's licensee to purchase it. If the city, or its licensee, do not buy, the present Company shall be granted further franchise on terms to be agreed upon at that date. The Company agrees to waive all rights to the streets of the city granted it by the Legislature of the State, and particularly under the act of 1865 known as the "ninety-nine year act." The city also reserves the right to make such other regulations as to matters not specifically covered by this ordinance at any time when the same shall seem proper.

The rate of compensation to the city has not been decided upon as yet, but it is proposed that the Company pay to the city a certain percentage of its gross receipts every year. After a certain number of years the city may waive the receipt of this percentage, or any part thereof, in favor of a reduction in the fares charged. Two exhibits appended to the ordinance specify the streets on which the Company may operate its cars and the details of construction of lines and rolling stock.

## Poster Art in Politics

Something unique in political campaign advertising was introduced into the late mayoralty contest in New York, when the Campaign Committee of the Citizens' Union used throughout the city posters, of which the accompanying illustration is a sample. The idea of using these artistic and effective posters originated with Mr. Charles R. Lamb, who superintended the execution of them and, by

strenuous efforts, succeeded in having them adopted. The posters contained each a telling phrase or two in favor of the Fusion cause. Outside of the political use to which they were put, the posters were probably the most artistic that have graced the bill boards of New York or any other American city, and much credit must be given Mr. Lamb for starting the ball rolling in the direction of using artistic advertising posters in place of the usual hideous signs that everywhere meet the eye of the traveler.

### City May Not Take Water without Compensation

In the suit of the Lonsdale Water Company against the city of Woonsocket, R. I., for an injunction restraining the city from diverting the natural flow of a certain stream from which the Company took its water, the Appellate Division of the Supreme Court sustained the contention of the Company. The city contended that it had the right to divert the flow because of its riparian ownership above the respondent, although the stream is not within the city limits. The master before whom testimony was offered by both sides, decided in favor of the Company and awarded the sum of $187,795.97 damages. The city then took the case to this Court. It was also decided by the Court that the city had not taken advantage of legislation passed so it could condemn land for its water works system. In sustaining the decision of the master the Court quoted as an authority the statement that there can be no such thing as ownership of flowing water. The riparian owner may use it as it flows; he may dip it up and become the owner by confining it, but so long as it flows it is free to all. Other authorities were cited to the effect that, while a city or company has the right of eminent domain to take a stream of water to supply a municipality, they can only do so by making compensation to those deprived of the use of the water.

## Meeting of Indiana Municipal League

The twelfth annual session of the Municipal League of Indiana was held in Terre Haute, November 11-13. Least year nearly 150 delegates attended and this year the number was increased to about 200. At the first session, Mayor Steeg, of Terre Haute, welcomed the delegates, pointing out that the object of the convention was for discussion of methods of government, each city being able to contribute something toward the work. City Attorney H. C. Skillman, of Greensburg, responded.

Before the evening session a conference of the representatives of the different branches of city government was held in the various offices of the city hall. The police officials took preliminary steps towards the formation of a police association. The first address of the evening session was by City Attorney T. J. Brock, of Jeffersonville, on "What Shall Be Done to the End That the Municipal League May Accomplish the Greatest Good for the Municipalities of the State?" Superintendent of Police McWeeney, of South Bend, led the discussion. "How Shall Indiana Cities Protect Their Boys?" was the subject of an address by Mayor C. W. Sherritt, of Muncie. Mayor J. H. Smith, of Bedford; Police Chief Harrison, of Lafayette; Councilman White, of Muncie; Councilman R. L. Buckles, of Vincennes, and City Attorney Moffatt, of Vincennes, took part in the discussion.

The first session of the second day was started at 8 o'clock in the morning, and the entire morning was given to street improvements, and only a part of the programme was carried out. Councilman W. P. O'Neal, of Richmond, spoke on "Practical Street Improvement," and Harry Strouse, of Elwood, opened what proved to be an interesting and profitable discussion. City Engineer Gridley, of Aurora, said that there seemed to be a unanimity of opinion in small cities that the cost of street improvements should be borne by the city at large. Mr. W. P. Blair, of the Terre Haute Brick and Pipe Company, called attention to the good paving in Terre Haute, and said that it was false economy to build cheap paving. A competent engineer should always be employed to look after street paving and a maintenance bond, in his opinion, was not worth the paper on which it was written if the city only employs an inspector and so takes part in the work of paving. City Attorney Moffatt stated that the law did not permit cities to require a maintenance bond or to retain any portion of the contract price for a street. He also stated that under the present law, if the assessments on property are not sufficient to pay for the cost of paving, the city must make up the balance. A city cannot compel repair to a sidewalk unless it brings increased value to the property. City Attorney Hauck, of Lawrenceburg, differed with Mr. Moffatt, while City Attorney Broadhus, of Connersville, supported him. City Attorney T. J. Brock, of Jeffersonville, also spoke on this subject. So much time was taken up with discussion that the following papers had to be omitted from the scheduled programme: "The Tramp from a Police Standpoint," by G. A. Harrison, Superintendent of Police of Lafayette; "Importance of the Legal Department to Municipalities," by Mayor Charles W. White, of Princeton; "Should the Installation of Sewerage Be at the Expense of the City or Property Owners?" by Councilman R. O. James, of Vincennes.

In the afternoon a trolley ride was taken about the city. At the evening session the papers of Superintendent of Police Harrison and Councilman Jones were read. A general protest was made by many officials against the metropolitan police system for the State with the Governor at the head. Mayor B. R. Russell, of Crawfordsville, spoke on the question, "In Whom Should the Control of Police in Small Cities Be Vested?" claiming that the mayor should have the control. Mayor W. C. Smith, of Elwood, said the Governor knew more of police matters in Elwood than he. At the close of the session a banquet was held.

The next session of the League will be held at South Bend. The following officers were elected: President, Judge George E. Downey; first vice-president, Mayor Edward Fogarty, of South Bend; second vice-president, Mayor Henry C. Steeg, of Terre Haute; secretary, George F. Harper, of Madison, and treasurer, L. W. Mellett, of Elwood, re-elected.

## Statistics of Arc Lighting in United States Cities and Towns

| | Population, 1900. | No. lamps. | | Watts at lamp terminals. | | Schedule. | Hours burn per year. | Cost coal per ton. | Contract price per lamp per year. |
|---|---|---|---|---|---|---|---|---|---|
| | | Open. | Closed. | Open. | Closed. | | | | |
| **OHIO (Concluded)** | | | | | | | | | |
| Shawnee | 2,966 | 50 | ... | 340 | ... | (1) | 4,000 | Gas | $70.00 |
| Shelby | 4,685 | 50 | 18 | 480 | 430 | (2) | 2,800 | $2.00 | z |
| Sidney | 5,688 | 77 | ... | 480 | ... | (1) | 3,675 | Gas | 75.00 |
| Springfield | 38,253 | 310 | ... | 480 | ... | (1) | 3,600 | 2.00 | 73.00 |
| St. Bernard | 3,384 | 83 | ... | 480 | ... | ..... | 2,220 | 1.70 | z |
| St. Clairsville | 1,210 | 32 | ... | 480 | ... | (1) | 4,000 | 1.00 | z |
| Steubenville | 14,349 | ... | 202 | ... | 480 | (1) | 4,000 | 1.35 | 75.00 |
| St. Marys | 5,359 | 73 | ... | 480 | ... | (2) | 2,179 | 1.95 | z40.00 |
| Tiffin | 10,989 | 81 | 80 | 480 | ... | (1) | 4,000 | 2.00 | 80.00 |
| Tippecanoe | 1,703 | ... | 30 | ... | ... | (1) | 4,000 | Gas | 90.00 |
| Toledo | 131,822 | 917 | 108 | 480 | 430 | (1) | 3,946 | 1.25 | 83.00 |
| Urbana | 6,808 | 103 | ... | 480 | ... | ..... | 3,000 | Gas | 80.00 |
| Van Wert | 6,422 | 74 | ... | 480 | ... | (2) | 2,479 | 2.45 | 81.25 |
| Wapakoneta | 3,915 | 75 | ... | 480 | ... | (1) | 4,000 | Gas | z108.32 |
| Warren | 8,529 | 127 | ... | 480 | ... | 56(1)<br>71(3) | 3,760<br>2,020 | 1.80<br>1.80 | 80.00<br>55.00 |
| Washington C. H. | 5,751 | 102 | ... | 340 | ... | (2) | 3,600 | 2.10 | 65.00 |
| Waverly | 1,854 | 40 | ... | 480 | ... | (2) | 2,179 | (8) | z |
| Wellston | 8,045 | 66 | ... | 340 | ... | (2) | 2,179 | 1.00 | 60.00 |
| Wilmington | 3,613 | 128 | ... | 480 | ... | (2) | 2,179 | 2.70 | 50.00 |
| Woodville | 831 | 20 | 4 | 340 | ... | (2) | 2,179 | 2.05 | 75.00 |
| Youngstown | 44,885 | 400 | ... | 480 | ... | (2) | 2,250 | 1.40 | 64.00 |
| Zanesville | 23,538 | 233 | ... | 480 | ... | (2)(3) | 3,800 | .75 | 73.50 |
| **OKLAHOMA TERRITORY** | | | | | | | | | |
| El Reno | 3,383 | ... | 24 | ... | 550 | (2) | 2,179 | 2.75 | 120.00 |
| Guthrie | 10,006 | 59 | ... | 480 | ... | (1) | 4,000 | 4.50 | 100.00 |
| Oklahoma City | 10,037 | 90 | ... | 480 | ... | (1) | 4,000 | 2.25 | 84.00 |
| **OREGON** | | | | | | | | | |
| Albany | 3,149 | 56 | ... | 480 | ... | (1) | 4,000 | W. P. | 90.00 |
| Ashland | 2,634 | 26 | ... | 480 | ... | (3) | 2,000 | (7) | 63.00 |
| Eugene | 3,236 | 23 | ... | 480 | ... | (1) | 4,000 | Wood | 108.00 |
| Forest Grove | 1,096 | 18 | ... | 480 | ... | (2) | 2,179 | Wood | 84.00 |
| Hillsboro | 980 | 19 | ... | 480 | ... | (3) | 1,825 | Wood | 120.00 |
| La Grande | 2,991 | ... | 4 | ... | 430 | (3) | 1,825 | W. P. | 86.40 |
| Marshfield | 1,391 | 16 | ... | 480 | ... | (1) | 4,000 | 2.25 | 102.50 |
| Pendleton | 4,406 | 20 | ... | 480 | ... | (1) | 3,650 | Wood | 168.00 |
| Roseburg | 1,690 | 15 | ... | 480 | ... | (1) | 4,000 | Wood | 120.00 |
| Salem | 4,258 | 90 | ... | 480 | ... | (1) | 4,500 | Wood | 71.40 |
| Silverton | 656 | 6 | 2 | 480 | ... | (3) | 2,098 | (7) | 78.00 |
| **PENNSYLVANIA** | | | | | | | | | |
| Allegheny | 129,896 | 1,361 | ... | 480 | ... | (1) | 4,000 | 1.35 | z |
| Allentown | 35,416 | 158 | ... | 480 | ... | (1) | 4,000 | 1.90 | 84.00 |
| Apollo | 2,924 | ... | 20 | ... | 430 | (1) | 4,000 | 1.75 | 60.00 |
| Baugar | 4,106 | 45 | ... | 340 | ... | (2)(3) | 2,400 | 2.25 | 57.50 |
| Bellefonte | 4,216 | ... | 50 | ... | 550 | (1) | 4,000 | 2.25 | 80.00 |
| Berwick | 3,916 | 70 | 9 | 480 | 430 | (2) | 2,179 | 1.55 | 80.00 |
| Blairsville | 3,386 | 40 | ... | 480 | ... | (1) | 3,933 | .80 | 70.00 |
| Bloomsburg | 6,170 | 67 | ... | 480 | ... | (1) | 4,000 | 1.70 | 80.00 |
| Braddock | 15,654 | ... | 359 | ... | 480 | (1) | 4,000 | .90 | 70.00 |
| Butler | 10,853 | 80 | ... | 340 | ... | (1) | 4,000 | 1.75 | 65.00 |
| Chambersburg | 8,864 | 210 | ... | 480 | ... | (1) | 4,000 | 2.80 | z |
| Chester | 33,988 | 196 | ... | 480 | ... | (1) | 3,800 | 2.70 | 84.00 |
| Clarion | 2,004 | 44 | ... | 480 | ... | (1) | 4,000 | Gas | 70.00 |
| Clearfield | 5,081 | 50 | ... | 480 | ... | (1) | 4,000 | 1.20 | 85.00 |
| Columbia | 12,316 | ... | 72 | ... | 480 | (1) | 4,000 | 2.60 | 80.00 |
| Connellsville | 7,160 | 45 | 25 | 480 | 430 | (1) | 4,000 | 1.12 | 65.00 |
| Conshohocken | 5,762 | ... | 47 | ... | 480 | (1) | 4,000 | 2.60 | 87.00 |
| Coudersport | 3,217 | 23 | ... | 480 | ... | (1) | 4,000 | Gas | 67.50 |
| Curwensville | 1,937 | ... | 16 | ... | 480 | (1) | 4,000 | 1.40 | 70.00 |
| Danville | 8,042 | 100 | 4 | 480 | ... | (1) | 4,000 | 1.75 | 80.00 |
| Dawson | 825 | 28 | ... | 480 | ... | (1) | 4,000 | .50 | 57.50 |
| Derry | 2,347 | 21 | ... | 480 | ... | (1) | 4,000 | 1.12 | 75.00 |
| Doylestown | 3,034 | 42 | ... | 480 | ... | (1) | 4,000 | 2.00 | 73.00 |
| Duquesne | 9,036 | ... | 36 | ... | 480 | (1) | 4,000 | .90 | 78.50 |
| Ebensburg | 1,574 | 18 | ... | 480 | ... | (1) | 4,000 | 1.70 | 85.00 |
| Elizabeth | 1,866 | ... | 24 | ... | 430 | (2) | 2,179 | 1.17 | 65.00 |
| Ephrata | 2,451 | ... | 23 | ... | ... | (2)(3) | 1,220 | 2.25 | 65.00 |
| Frackville | 2,594 | 86 | 1 | 480 | ... | (1) | 4,000 | .85 | 29-95<br>59-100 |
| Freeland | 5,254 | 63 | ... | 480 | ... | (1) | 4,000 | 1.35 | 80.00 |
| Gallitzin | 2,759 | ... | 18 | ... | 430 | (1) | 4,000 | 1.50 | 80.00 |
| Gettysburg | 3,495 | 60 | ... | 340 | ... | (1) | 4,000 | 2.65 | 60.00 |
| Greensburg | 6,508 | 140 | ... | 480 | ... | (1) | 4,000 | .75 | 75.00 |
| Greenville | 4,814 | 22 | 19 | ... | ... | (2) | 2,600 | 1.40 | 64.00 |
| Hamburg | 2,315 | 27 | ... | 480 | ... | (1) | 4,000 | 2.20 | 80.00 |
| Harrisburg | 50,167 | 408 | ... | 480 | ... | (1) | 4,000 | ... | 82.50 |
| Homestead | 12,554 | ... | 72 | ... | ... | (1) | 4,000 | .90 | 75.00 |
| Honesdale | 2,864 | 37 | 11 | 480 | 550 | (1) | 4,288 | 2.50 | 73.50 |
| Huntington | 6,053 | 51 | ... | 480 | ... | (3) | 2,000 | 1.85 | 54.25 |
| Indiana | 4,142 | 63 | ... | 340 | ... | (1) | 4,000 | 1.30 | 60.00 |
| Jermyn | 2,567 | 36 | ... | 480 | ... | (1) | 4,000 | .70 | 72.50 |
| Johnstown | 35,936 | ... | 245 | ... | 480 | (1) | 4,000 | 1.10 | 75.00 |
| Kennet Square | 1,516 | 3 | 5 | ... | ... | (1) | 4,000 | 2.70 | 100.00 |
| Kingston | 3,846 | 125 | 10 | 480 | 430 | (1) | 4,000 | ... | 77.50 |
| Lancaster | 41,459 | 308 | ... | 480 | ... | (1) | 4,380 | W. P. | 70.00 |
| Lansford | 4,888 | 52 | 16 | 480 | 430 | (1) | 4,000 | .35 | 95.00 |
| Latrobe | 4,614 | 44 | ... | 480 | ... | (1) | 4,000 | .95 | 70.00 |
| Lebanon | 17,628 | 125 | ... | 480 | ... | (1) | 4,000 | 2.50 | 00.00 |
| Lehighton | 4,629 | 56 | 8 | 480 | ... | (1) | 4,000 | 1.90 | 60.00<br>50.00 |
| Lockhaven | 7,210 | 74 | ... | 480 | ... | (1) | 4,000 | 2.15 | 72.00 |

(1) All night. (2) Moonlight. (3) Midnight. (4) After midnight up to 1 or 2 A. M. The difference in time may be judged from the column showing number of hours lamps burn. (6) Rent power. City owns lamps and dynamo. (7) Water power and steam. (8) Sawdust. z Municipal plant.

*(To be continued.)*

# FIREPROOFED WOOD FOR BUILDING

## "Fireproofed" vs. "Fire-Resistant" Wood—Tests Applied in New York and the Advantages Secured—Rapid Progress Being Made in Building Construction

*By Prof. Ira. H. Woolson**

### Methods of Testing in New York

In the early stages of experimentation it was customary to build a small house of the wood to be tested, usually duplicated by a house of untreated wood; then applying a vigorous fire both inside and out, and noting results. This method possesses spectacular elements which are very convincing, and while it may be useful as a general test to demonstrate the degree of immunity from fire that a wooden building may be made to possess, the heavy expenditure of time and money required for such a test precludes the possibility of employing it for regular series work. This is the only value such a demonstration possesses, for the results of fire tests made upon wood treated a year or so ago, may bear no relation to the product of the same company to-day. It is essential for public safety, that regular serial tests should be made upon all material delivered for use, as is the custom in the manufacture of steel, cement and other structural materials.

Unfortunately there is no recognized test for fireproofed wood. In America a variety of tests have been proposed by different investigators, most of them being the direct application of heat or flame to small test specimens, and noting the duration of flame and glow produced, as well as the amount of wood consumed. One method recently proposed makes the amount and character of gas given off from dry distillation of small fragments of wood a basis of classification, but no uniform method has yet been adopted.

An effort was made a year ago by the Building Bureau of New York City, in conjunction with the various fireproof wood manufacturing companies, to decide upon some standard method of test. But the project was abandoned. The present method of testing is as follows:

When a shipment of lumber is prepared, an inspector proceeds to the works, and selects at random one sample from every 2,000 ft. of material. This is sent to the laboratory and tested; reports being sent to the Building Bureau and the manufacturer. Two tests are applied to each sample. One a "shavings test," which is a test used by the U. S. Navy, and the other a test devised by the writer, which for want of a better name is called a "timber test."

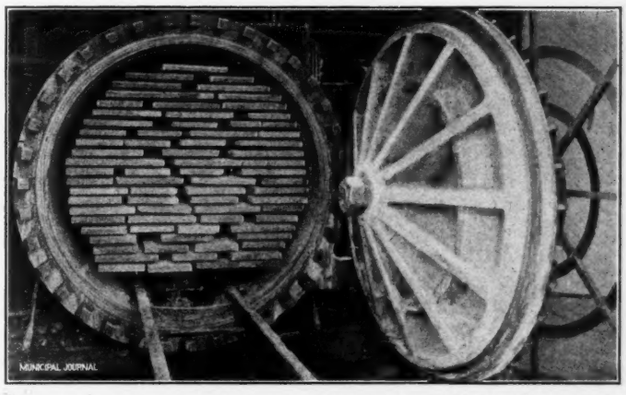
The shavings test, while useful in a general way to determine the flaming properties of treated wood, is, nevertheless, unsatisfactory. We are now making series of different tests in an endeavour to supplant it with something more reliable. The test is conducted as follows: A pan one foot in diameter and six inches deep is mounted on legs. The bottom is formed by a heavy wire screen of one-half-inch mesh. This wire bottom is covered with a layer of shavings two inches deep, and a Bunsen burner is applied underneath for twenty-five seconds; then the burner is removed, and the lengths of time during which the shavings support (1) flame and (2) glow are recorded, and also the area of shavings burned.

The idea of this test is that shavings from properly-treated wood will not support flame any considerable time, and that the flame will gradually die out without material enlargement of the burned area. After test, the remaining shavings are thrown away. There are no means for making a permanent exhibit of the results, except by photographs, which would be difficult to take and quite unsatisfactory. The wood must be accepted or rejected on the judgment of the operator, based upon notes taken while observing the test.

### Objections to Shaving Test

Besides these obvious disadvantages, there are two other strong objections to the shavings test: first, the extreme difficulty of always maintaining the same conditions of flame and heat under the shavings; and second, the impossibility of securing a uniform quality of shavings for tests. The Navy specifications call for the use of the Bunsen burner with a flame giving about 500° Centigrade = 932° Fahrenheit. Now, Bunsen burners vary considerably in the size of flame they produce, so, although every precaution was taken and the same standard temperatures were determined in each of two flames at some definite point, the results of tests upon the same kind of shavings might show widely different figures, because of the general variation in the character of the flames. Much depends also upon how and where the tests are conducted; whether under a smoke hood with a strong draught, or in an open room where air currents could strike the flame and cause it to sway. The most serious objection, however, to the shavings test, and the one which, in the writer's opinion, is fatal to its use as a standard method of comparison, is the impossibility of making the shavings of uniform size and quality.

Another objection is that in coarse grained wood like oak, the plane, in making the shavings, splits many of the large pores and allows the crystallized chemical to fall out, thus removing a part of the fire-resisting agent. Lastly, no wood in the form of shavings would be exposed to fire in a building. It would seem that further evidence is unnecessary to demonstrate the inappropriateness of this test alone as a standard of comparison.




METHOD OF STACKING WOOD IN DIGESTER OF AMERICAN WOOD FIREPROOFING CO., NEWARK, N. J.

To avoid the difficulties of this and similar tests, the previously mentioned "timber test" was designed. Though not entirely satisfactory, the results, as a whole, have been gratifying. During the past two years, the writer has conducted over 4,000 tests upon fire-proofed wood, the majority being "timber tests." Scarcely any criticism of the method of test has been offered by clients, though the results were often not gratifying.

### "Timber Test"

The specimens for this test are accurately cut to a size 1½ inch by ¾ inch by 12 inches. These "timbers" are tested in pairs by being laid across the top of a six-inch gas crucible furnace, in which a constant temperature of 926° C. = 1,700° F. is maintained. This particular temperature was chosen because it is given by the New York Building Code as approximately the heat of a burning building. At the end of two minutes the specimens are removed, and duration (1) flame and (2) glow noted for each.

The temperature is under constant control by means of a Le Chatelier pyrometer, the "couple" being placed between the two specimens, thus recording the heat exactly at the point of application. The proportions of gas and air are regulated to furnish a vigorous flame eight to ten inches above the furnace, so imitating an ordinary fire.

* Of Columbia University, New York, who read this paper before the International Fire Prevention Congress, held in London, Eng., July 6-11, 1903.

After test, the specimens are sawed in two at the middle and tracings made of the unburned wood. These tracings are then carefully measured by planimeter and the percentage ratios to the original cross-section calculated. The percentage of unburned wood is printed upon the tracing of each specimen, and then blue prints are made which become a part of the permanent record.

It will be noted that tested specimens show a straight line in the cross-section on the side not exposed to the fire, whereas the untreated specimens are burned on all sides. This is good evidence of the fire-resisting properties of the wood. In general, the untreated woods show a cross-section area approximately 10 to 25 per cent. less than the treated samples. However, the value of the "fireproofed" wood cannot be rated by this feature alone. Account must be taken of the tendency to ignite and support combustion. This is indicated by duration of flame and glow, after the specimen is removed from the fire. In every instance the contrast in time of flame and time of glow, between the treated and the untreated wood, is very marked. The average duration of each taken from 688 tests on four varieties of treated soft woods was seven and twelve seconds. The same data was taken from 846 tests on four varieties of treated hard woods was ten and fourteen seconds.

Similar calculations based upon tests of untreated wood, though not averaged from nearly so many tests, gave for soft woods, flame, 1 min. 19 sec.; glow, 1 min. 53 sec.; and for hard woods, flame, 2 min. 31 sec.; glow, 6 min. 29 sec.

Those figures give a ratio of 1 to 11 and 1 to 9 for flame and glow between treated and untreated soft woods, also 1 to 14 and 1 to 27 for hard woods. That is, the tendency of untreated woods to burn is ten to twenty times that of treated woods. This measure of the property or retarded combustion is as important as the determination of the percentage of unburned areas, for in the first stages of a fire, minutes are valuable. Experience has shown that a variation of 5 per cent. should be allowed in cross-section area, because of structural differences in the wood, fluctuation in temperature, and personal error in measuring. In fact, like all investigative work, it is never safe to estimate average values from the results of a few tests.

### Advantages of Test

The advantages of this method of test are: (1) a test piece of uniform size, large enough for practical comparisons, and small enough for numerous tests to be made with slight waste of material, thus ensuring a fair average report; (2) a constant temperature and uniform time of application of heat; (3) an estimate of the tendency to support combustion as indicated by the times of flame and glow; (4) the ability to accurately measure the amount of burn, and make a drawing of same for permanent record—the specimen itself can also be easily preserved for future reference if desired. In brief, every element of the test is practically constant, except the character of the wood and the treatment it has received. Necessarily these must always remain variable.

The lumber is thoroughly dried before testing, and care exercised to keep everything uniform.

The specimens are placed so the side which was originally the outside surface of the board faces the fire. This is necessary because the Building Bureau permits one-inch outside treatment on floor sleepers and other large materials, which is encased in concrete or a coating of other fireproofed wood.

It will be noted that hard woods, like long leaf yellow pine, oak and maple, when treated, differ only slightly in unburned area from untreated lumber.

They are naturally "slow-burning" material. It would scarcely be necessary to fireproof hard wood if the preservation of structural strength were the only consideration. But the danger from inflammability should make a surface treatment imperative. Soft woods which waste rapidly under flame should be treated throughout.

### Treated Wood Has Failures

Although treated wood has many advantages as a fire retardant, it also has its failings, the worst being its tendency to become hydroscopic. There are processes which claim avoidance of this tendency to gather moisture when exposed to dampness, but I have had no opportunity to prove their merits. Because of this difficulty, the Navy has discontinued the use of fireproofed wood, except for interior trim, furniture, &c.

When in this damp condition a new difficulty arises, because the chemicals employed produce a corrosion on metals. Neither of these difficulties appear harmful where the wood is ordinarily dry and protected by paint, varnish or oils.

A strong point in favor of the treatment is, that the wood does not seem to become perceptibly more combustible by the application of oils and varnish. Among the experiments I will make at the conclusion of this paper is one designed to demonstrate this feature.

A further defect of treatment is to weaken the wood and make it brittle. Although this does not always result, it is a recognized possibility, and the Navy specifications reject material which has lost over 30 per cent. of its original strength.

In New York City no attention is paid to the question of strength, for the method of steel construction does not require the wood to support loads.

Whether the treatments are permanent, I am not prepared to state. Our experience with them is too short to predict a positive opinion. Samples kept in my laboratory two years show no signs of deterioration, and we have here some samples treated in 1895 which we will test to show they still retain their fire-resisting qualities.

Some processes, however, do employ volatile chemicals, as is evidenced by a bloom which appears on the wood after standing for some time. So far as my experience goes with lumber treated for New York City there is very little tendency for this sort of deterioration. Neither has there been any evidence of decay. When used under ordinary conditions of dryness, and protected as it usually is, I see no reason why well treated wood should not remain sound and effective indefinitely. However, I believe, the question is one to be systematically investigated.

There are two other well-known defects, namely, discoloration and difficulty in working due to hardness. Both of these are increased by excessive treatment, hence the manufacturer is always tempted to lessen the treatment. This fact is the only argument necessary for regularly testing the material as delivered for use.

Last, but not least, from a builder's point of view, the wood is costly. But considering the awful destruction of life and property which fire constantly causes, the saving of expense should not be allowed as an excuse for the use of inflammable materials which invite public calamity.

### Guarding Against Gasoline Danger

As part of the great scheme of the fire departments of the country towards the prevention of fire, the regulations governing the storing of inflammable materials, such as gasoline and kerosene, play an important part. While recognizing the need of these oils in private and commercial use, the object of the departments is to so regular their storage that, as far as possible, danger from fire will be eliminated. The officials of the Washington, D. C., Fire Department, are especially anxious to eliminate all danger from oil fires because of the small size of the force, which is not large enough to handle too great a blaze, although its efficiency cannot be questioned. When Robert W. Dutton became chief of the Department he recommended that one of the foremen of the Department be appointed Assistant Fire Marshal to assist Marshal Bieber. During the past year and a half these officials have visited every hotel and apartment house and have reported to the Commissioners on each case. Numerous changes have been effected in many instances. Daily visits are made to different houses to see that the regulations are carried out. No one is allowed to keep inflammable oils for sale if any portion of the building is occupied for dwelling purposes. Kerosene may be kept on such premises in limited quantities. A vigorous campaign has been begun by the Fire Department officials against gasoline, for they consider it the duty of fire department officials to do what they can to prevent as well as extinguish fires. Gasoline, in the opinion of the Washington firemen, is more dangerous than gunpowder, and is one of the most common causes of fire known.

## Houston's New Central Fire Station

THE new central fire station at Houston, Texas, now in process of construction, when completed, will be one of the finest and most completely arranged fire headquarters in the southwest, and will cost something over $30,000. The entire architectural effect will be of the Renaissance style.

Of two stories in height and extending 100 feet on each of the intersecting streets, there will be three ten-foot exits for the apparatus on each street with one entrance at the rear so arranged that all of the apparatus can drive in by this rear door and take their respective place in a most convenient way without having to back. The floor of the rear drive is sixteen feet wide and will be used for washing apparatus. The entire lower floor will be paved with vitrified brick, the stalls will be paved with creosoted cypress blocks and connected to the sewers.

On this floor there will be a steamer, hose wagon, chemical engine, and ladder, truck and eighty-five-foot ærial, chief and assistant chief's and electrician's buggy. All apparatus will have its own door except the buggies, which will follow each other; the stalls are so arranged that the horses will stand just to one side and to the rear of the tongues of the apparatus. On this floor will be placed the captain's office in the rounded corner enclosed by railing, where will be placed all the necessary electrical and mechanical apparatus. The doors will slide back into the wall and will open automatically when the driver is in his seat. There will also be a

NEW DEPARTMENT HEADQUARTERS, HOUSTON, TEX.

workshop and feed room, harness and supply room. The workshop will be equipped with an electric lathe, drill press, etc. The sixteen-foot rear driveway will be one story and arranged with racks for drying hose.

The main entrance to the second floor will open out into a large hall along which will be the offices, bedrooms, the dormitory for the men, which will be handsomely furnished and provided with three sliding poles, so arranged that each man will slide to a convenient position near his apparatus. Each of the rooms will be provided with a private bath and toilet. These rooms will be 15 x 15, the offices will be 15 x 20 feet, the dormitory will be 31 x 52 feet and have a south exposure with an ornamental balcony at each window and a staircase to the lower floor on the inside of the building for the use of the men. Occupying the rear corner will be the gymnasium 42 x 52 feet, fitted with all the most approved apparatus for the exercise of the men. Between the dormitory and the gymnasium will be the four bath and toilet rooms and lockers for the men; in all there will be six sliding poles.

The entire arrangement of the ground floor is to be done under the supervision of Chief J. P. Arto, who has made a close study of all details for the necessity and convenience of the men and apparatus. The electrical wiring is to be done by the city's Electrical Department under the supervision of City Electrician Clarence George and will include all the latest electrical appliances that can be used in a fire station, each office and room will be wired for electric lights, fan, call bells, and intercommunicating telephones, and public telephones. There will be four telephones in the captain's office, on the lower floor, two for public use, and two for receiving fire alarms, only they will be placed one on each side of the fire alarm transmitter, and near at hand will be placed a row of push buttons, for ringing call bells on the second floor when receiving an alarm by telephone, these bells can all be rung at once or individually, by the movement of one lever, as may be required, at the same time releasing all horses, from their stalls, preparatory to sounding the alarm on the general system.

The electrician's office will be equipped with a ten-circuit Gamewell storage battery switchboard and repeater.

There will be twenty-eight men in the building. It is the intention of Chief Arto to arrange all harness to be hung by automatic hangers, and to overlook nothing which will be a pride to a city of twice the size of Houston.

## To Provide Against Danger from Fire

AN ordinance providing for the prevention of fire has been adopted in Jackson, Mich., and it has met with the approval of the public and insurance people. A decrease in insurance rates is predicted as a result of its enforcement. The provisions of this ordinance are as follows:

It shall be unlawful for any person or persons to burn trash, straw or any combustible substance between the hours of sunset and sunrise.

It shall be unlawful for any person, firm or corporation to use or have set up for use any stove or range which is not placed or does not sit or stand on brick or stone or other fireproof material.

No person, firm or corporation shall keep on hand at any one time or in any one building exceeding ten gallons of gasolene, benzine or naphtha, except in a fireproof building or vault erected for that purpose, in which all openings are covered with metal shutters, said building to be not nearer than 25 feet of any other building, and at no time shall more than 110 gallons be stored in said building, and said gasolene, benzine or naphtha shall always be kept in a drum used for that purpose, and no delivery shall be made at any time by artificial light, and under no circumstances after sundown of any day.

It shall be unlawful for any person or persons to place and let remain longer than six hours, in any alley-way, opening or within 30 feet of any house, empty boxes, barrels or other combustible material.

All stove flues hereafter built in the city of Jackson shall be built of hard burnt or fire-clay brick and lined inside throughout with fire-clay piping, and so placed as to rest on iron or other non-combustible material, and have no wood placed in them in any way.

No person shall be permitted to place within any building within the city of Jackson ashes in any box, barrel or other wooden vessel, or upon any wooden vessel or floor, unless the same is immediately removed from the building, and with contact with such building, and all owners or occupants of buildings in Jackson are required to permit the chief of the Fire Department, or any officer or member of the police force to inspect their buildings to see if the above is complied with, and it is hereby made the duty of the chief of the Fire Department and of the police force to make such inspections whenever and wherever they may suspect a violation of the above.

# WHAT POLICE AND FIREMEN ARE DOING

## Paid Departments Probable in Two Cities—Want to Abolish Graded Service—Capital City Fire Force During Past Year—Fire and Police Personals

### Paid Department Recommended for Harrisburg

The Board of Fire Underwriters, of Harrisburg, Pa., representing about eighty-five insurance companies, recently took formal action towards the improvement of the fire service in the city. A resolution was unanimously adopted requesting the Councils to take immediate steps to improve the present service by dissolving the volunteer organization and creating a paid department. The movement for a paid department, which has been under way for some time, will be strengthened by this action of the Underwriters. While the Board recognizes the efficiency of the volunteers, it is of the opinion that the service is inadequate for a city the size of Harrisburg, and that a paid department is necessary.

### Want to Abolish Graded Service

The members of the St. Paul, Minn., Fire Department have petitioned for an increase in salary and ask the support of the Fire Commissioners in securing it. The Commissioners cannot, of themselves, grant the increase, as it will be necessary to secure an amendment to the city charter, but the official approval of the Commissioners is asked. The men promise to take up the matter with the people, and, by agitation, obtain the amendment at the next election. In 1896 a cut was made in the salaries of the firemen, but the men do not want a return to the old figures, as the service was graded at that time, as now. They ask that grades be obtained, and all of one class of men receive the same salary. It is claimed in the petition that the city of St. Paul is the only one having a graded service, and, furthermore, it is argued that, inasmuch as a man in one grade puts in as much time as men in others, they should all receive the same pay.

The statement that St. Paul is the only city in which men are graded, is far from the truth, as in the great majority of city fire departments is this the case. It is but natural that it should be so, as there is then some incentive for men to do well that they may reach a higher grade and receive larger compensation. When all are alike, new men and old, good men and poor, competition is eliminated and the men must wait for vacancies to occur in positions above them before they receive advanced wages.

Under the present scale the pay in St. Paul is as follows: Captains, $81 to $85 a month; lieutenants, $71 to $75; truckmen, $62 to $71; pipemen, $62 to $70; engineers, $79 to $83; stokers, $63 to $70; engine and truck drivers, $63 to $67; hose drivers, $58 to $62. The increase asked for would give all the men the minimum pay in each class. It is true that the St. Paul men are the lowest paid of firemen in cities of about this size, but in increasing their salaries it would be wiser to retain the grades, the salary attached to each being advanced in proportion.

### Paid Fire Department for Atlantic City

After much discussion, the paid fire department for Atlantic City, N. J., seems to be a settled thing, and at the present date the Council is considering the passage of an ordinance creating the department. The previous ordinance, which was killed by the Council, was loaded down with amendments and gave no power to the commissioners. They would have to do the work while the Council retained the honors and influence. The new ordinance places the complete control of the department, including the purchase of apparatus, in the hands of the fire commissioners. The ordinance provides that the Board of Fire Commissioners shall consist of three members to be appointed by the Council, for different terms so that one will be appointed every year. After the first appointments the terms of all shall be three years. Each Commissioner must give a bond of $5,000 and is to receive an annual salary of $500.

The Commissioners are to employ such members of the department as may be necessary, fix the compensation and duties of the same and establish such rules and regulations as they may deem proper. They shall have the power of removing any member of the department for cause after a trial. Semi-annual reports must be made to the Council showing the conditions of the Department.

The ordinance also provides for the punishment of any one that injures any property of the Department, hinders the men in the discharge of their duties, or wears any uniform that may be adopted by the Commissioners for the firemen. The men and apparatus, of course, are to have right of way in the streets. The first day of January, 1904, is the date when the volunteer department is to be disbanded and the paid fire department take its place.

### To Reorganize Police Force of Portland

For nearly a year the citizens of Portland, Me., have been waiting to vote on a bill to reorganize the Police Department of their city. The act was passed by the last Legislature and approved by the Governor. An attempt was made to place the Department under a board of commissioners, but this was taken out before the bill passed. The present bill provides that the Department shall consist of a chief, two captains, two inspectors, four sergeants, fifty-five patrolmen and a matron. The mayor is to have the appointment of the members of the Department. The chief is to hold office until January 1, 1905, or until his successor is appointed, sergeants and captains are to serve during good behavior and the matron is to serve four years. Upon reaching the age of sixty-five, members of the force are to be honorably discharged. The mayor is to have the power to make all the regulations for the Department, and shall have the power to remove any member for cause.

### Past Year in Detroit's Police Department

The thirty-eighth annual report of the Metropolitan Police Department of Detroit, Mich., covers the year from July, 1902, to July, 1903, and is gotten up in the usually complete manner attending the reports from this Department. The report in addition, is neatly printed and illustrated, and ranks with the best police report issued by any city. Commissioner George W. Fowle, calls attention to the growth of the city and the increasing difficulties attending proper patrolling with the present force, but the work of the men was as satisfactory as could be expected under the circumstances. Inasmuch as many people claim, when arrested, that they were ignorant of ordinances that they had violated, the Commissioner suggests that some way be devised whereby greater publicity could be given a newly enacted ordinance. Notwithstanding the number of visitors that came to Detroit during the year, the report states that no one went away complaining, and no accident marred the visits. Commissioner Fowle states that it is strongly impressed upon the men that, to command respect, policemen must deport themselves so as to deserve it. "A policeman's address should always be pleasant and conciliatory; his appearance, neat and cleanly. * * * As an officer of the law, a policeman should never himself be a violator thereof. The authority with which he is clothed he should use fairly and moderately and without abuse." The Commissioner is pleased that, while some serious crimes were committed, all offenders were quickly punished.

Secretary William F. Connolly reports that the department had a cash balance of $3,265.65 turned over to the City Treasurer at the end of the year. The receipts of the year amounted to $567,019.82 and the expenses to $562,859.24. The Superannuated Police Fund showed $13,742.55 in previous balance and receipts and disbursements on the regular salaries of retired officers in the sum of $7,493.20. Fines from policemen, rewards, donations, receipts for destroyed slot machines and 1 per cent. from the salaries of active and retired policemen form the main sources of revenue for this fund.

## Washington Department During the Year

THE report of the Fire Department of Washington, D. C., for the year ending June 30, 1903, was recently issued. It was written by Robert W. Dutton, former chief of the department.

The number of alarms was larger than for the preceding year by forty-eight, having amounted to 819, of which fifty-six were false. The increase in fires was laid to the large use of oil during the coal strike of last winter. The total estimated loss was $157,261, or less than 7 per cent. of the insurance.

The only addition the department had during the year was the installation of a chemical company in Congress Heights. Last January three extra first-class Metropolitan steamers and a Seagrave aerial truck were purchased on Mr. Dutton's recommendation. The latter piece of apparatus is equipped with a seventy-foot ladder which the men learned to raise in twenty seconds. A chemical engine with two thirty-five tanks was placed in the new house on Congress Heights. It is hoped that the department will soon be able to replace all of its antiquated hose reels with modern apparatus. When Truck G is installed in the house now being erected, the department will consist of fourteen steam engine companies, seven truck companies and five chemical engine companies. These twenty-six companies, in the opinion of Mr. Dutton, will be but one-half what is needed in the department, and he recommends that as soon as possible there should be established in the northwest section two or three additional steam engines and a truck company; a steam engine in the southeast; a steam engine and truck in the northeast; and a chemical company in several suburban districts. In addition there should be purchased three steamers for reserve, as at present, there are but two engines available for such purposes and these have been placed in commission to take the place of disabled engines. Another reserve truck and a reserve chemical engine should be provided. A repair or machine shop should be provided as previously recommended.

In July, 1903, the Commissioners ordered that applicants for appointment to the department should pass a mental examination and the United States Civil Service Commission conducted the examinations, passing 63 per cent. of all applicants. Simple arithmetic and spelling, penmanship and local geography and the ability to receive and record short and simple telephone messages were the tests used. Mr. Dutton believes that the fire service of to-day requires intelligent men and should be supplied with them; also that the pay of the men should be raised.

More fire hydrants should be put in, especially in the suburban sections, and Mr. Dutton renews his recommendation that a high pressure water system for fire fighting should be installed, as it would mean both quicker and better service than could be rendered by double the number of engines n service at the present time. An inspector of oils should also be appointed to relieve the fire marshal. A school of instruction to train the newly appointed men could be added to the department with profit. Every public school should be in direct connection with the fire alarm headquarters, and all should have fire escapes of a more efficient design than those in use in many of the District's schools at the present time.

### Annual Parade of Washington's Finest

THE annual parade and inspection of the Police and Fire Departments of Washington, was held on November 4. The District Commissioners and guests reviewed the men and the flags that are competed for annually by the two departments were presented to the winning company and precinct. The Wight flag was presented to the eighth police precinct which had won the flag because of the exceptionally fine showing made at the station house. Engine Company No. 10 won the Macfarland flag for the Fire Department, the condition of the house during the year having been excellent and not a charge of any kind having been made against any of the company's members. The showing made by the Fire Department in front of the White House was especially attractive. An exhibition of a quick run and hose laying was given by an engine company and a truck company went through a ladder drill. The water tower was also brought into play. Major Sylvester, Chief of Police, was given a surprise in the evening when all the captains and lieutenants of the force paid him a visit at his home.

## Fire and Police Personals

—The salary of Chief of Police Knapp, of Toledo, O., has been increased from $1,900 to $2,400 per year.

—Chief Henry J. Eaton, of Hartford, Conn., after thirty-five years of service in the Fire Department has resigned.

—Chief Joyner, of Atlanta, Ga., has accepted the invitation of the city officials of Jackson, Miss., to take charge of the organization of a paid fire department there.

—William H. Sprung, who was at one time chief of the Rochester, N. Y., Fire Department, died in Spencerport, in the latter part of October, at the age of eighty.

—It has been rumored in Newark, N. J., that Chief of Police Henry Hopper, was about to resign. It is claimed, however, that such a step would be a voluntary one on the part of the Chief, as he is in perfect accord with the Commissioners.

—Chief Robert Cline, of the Fire Department of Wheeling, W. Va., has drawn up a new set of rules for the government of the Department. These involve numerous changes in the old rules, and the Fire Committee of the Council has taken the changes under advisement.

—Chief of Police E. M. Woydt, of Spokane, Wash., recently appeared in the police court and pleaded guilty to a charge of assault on a citizen. The Chief made public apology to the complainant and the people of the city and the judge let him off with a fine of $10 and costs.

—For some time the city of Taunton, Mass., has been stirred up over the trial of Chief of Police Charles R. Dunbar, who was charged with failure to carry out the laws. After considering all the evidence, Mayor Warner reported to the Council that he found the charges against Chief Dunbar were not sustained.

—In view of the possible resignation of Chief Webster, of the Alexandria, Va., police force, the City Council recently ordered the City Auditor to draw a warrant for $750 in favor of the Chief whenever the latter should resign his position. The Council wished in that way to show its appreciation of Chief Webster's long service.

—Chief John T. Janssen, of the Milwaukee Police Department recently celebrated the fifteenth anniversary of his accession to office. He was appointed to the force as patrolman in 1877, and worked his way up to the present position by establishing a good record. He has been twice president of the National Association of Police Chiefs.

—At the recent meeting in Buffalo, N. Y., the Association of the Police Chiefs of the State of New York, Chief Ewing Barnes, of Cortland, gave his views on gambling and its control. He thinks that a private gambling game should not be interfered with, but the police chiefs should use every means to put down crooked games —games run where liquor is sold and when boys and people not able to play, take part.

—It is stated by the local press that Charles E. Coots, Chief of the Indianapolis Fire Department, will be retained by a new administration, and that the Department will be completely divorced from politics. This is the advice of many of the Democratic leaders and will probably be followed by the Mayor and Board of Public Safety, in as much as the Democratic party made the campaign this fall against politics in the Fire Department.

—Chief Hodgkins, of the Oakland, Cal., Police Department, has been getting into trouble lately with the City Council. The ordinance and judiciary committees of the Council have been putting some embarrassing questions to the Chief relative to his non-enforcement of the laws in connection with the slot machines. The Chief was forced to admit that he knew that these machines were running, but claimed that the old police board had given him permission to let them continue.

—Michael J. Healy, chief of police of Manchester, N. H., whose administration has won for him the title of "Czar," has enforced the blacklist clause of the new license law. This provides that saloon keepers shall not sell liquor to habitual drunkards on pain of losing their licenses. A list of 180 persons has been prepared by the Chief and the same posted where all could read. Many citizens requested that relatives be posted because of their addiction to drink, but the Chief investigated every case before taking action.

# LITERATURE ON MUNICIPAL TOPICS

## Reviews of Some Important Books—What the Magazines and Reviews Have to Say About Civic Affairs—Municipal Reports Received

### Books

THE question how best to deal with criminals within prisons and other penal institutions and how to go to work to abolish the causes that lead to crime has been the subject of study by criminologists for many years. It is simple enough to map out in theory courses that will abolish crime, but, when the effort is made to put in practice the theory, the results are not always what were expected. The experience of those that have done practical work among criminals in the effort to reform them, will be of interest and benefit to students of crime, and officers of penal institutions, for it is not what any one may think, but what he knows to be true. In *The Criminal Classes, Causes and Cures,* D. R. Miller, D. D., former chaplain of the Ohio Penitentiary and suerintendent of the Girls' Industrial Home of Ohio, has given his experience with the inmates of the Penitentiary, and what he and the other officials were able to do towards reforming many of the prisoners. After showing that one in 140 so-called civilized persons is a criminal, whether detected or not, and that crime is costing the governments millions of dollars every year, the author recites a large number of cases of representative crimes, giving but an outline of the facts and endeavoring to place in a brief manner, the cause of the wrongdoing.

As some of the causes of crime he assigns intemperance, vile and sensational literature, ignorance, unrestrained passion, the endeavor to live beyond one's means, criminal associations. The cures for these are obviously things that will lead the criminally inclined into the opposite paths. Child-saving institutions where the young may receive the proper training and be kept from evil influences when their habits are forming, and moral and religious efforts that will lead to the doing of right for right's sake instead of to escape punishment, are given as potent factors in the work of preventing and reforming criminals. Cloth, 227 pages, price $1 net.

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THE census reports of 1900 showed that the urban population, while increasing, was not doing so at the rate recorded by the previous census, and it has been stated that the extension of the trolley lines into the country districts and the consequent facility with which people in outlying sections can come into the cities for business purposes, have done a good deal to check the growth of the cities and prevent the overcrowding that is inevitable. If that is so the interurban electric lines will prove a blessing to the city dwellers as well as to those in the country, for they will check too rapid urban growth and prevent the unhealthful conditions due to overcrowding. *Engineering Preliminaries for an Interurban Electric Railway* is a small book of some 70 pages by Ernest Gonzenbach, who, in describing the building of one interurban railway, points out the things to be avoided to make a road a paying investment as well as a comfort to the local traveling public and a better competitor of the neighboring steam railroad. Good, rapid, frequent trains or cars, a good roadbed, all the safeguards used by steam roads in the way of block signals, occasional "limited" cars, and the spending of more money than is usual in cars, track ballast, waiting stations, etc., will secure the business, please the public and will make the road successful in every way. The author has endeavored to show where mistakes are made in the various details of construction and to contribute "towards securing a permanent standard of construction without lavish or excessive cheapness." Price, cloth, $1.00.

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*History of Socialism in the United States.* By Morris Hillquith. Cloth, 373 pages, $1.50. Funk & Wagnalls Co., New York.

*Civics: What Every Citizen Should Know.* By G. Lewis. Cloth, 210 pages, 45 cents. Penn Publishing Co., Philadelphia.

*The People of the Abyss.* By Jack London. Cloth. $2 net. Macmillan Co., New York.

*British Cities and Their Problems.* Milo Roy Maltbie. The Macmillan Co., New York.

*Water Supply.* A Student's Handbook on the Conditions Governing the Selection of Sources and the Distribution of Water. An English work. By Reginald E. Middleton, C. E., M. E. Cloth, 168 pages, 66 figures. $3 net. J. B. Lippincott Co., Philadelphia.

*Engineering Contracts and Specifications.* Including a brief synopsis of the law of contracts and examples of the general and technical clauses of various kinds of engineering specifications. By J. B. Johnson, C. E., M. E. Cloth, 452 pages, $3. Third Edition. *Engineering News* Pub Co., New York.

*Infection and Immunity; or the Causes and Prevention of Infectious Diseases.* By George M. Sternburg, M. D., LL. D., Surgeon-General of the U. S. Army. Cloth, 293 pages, $2 net. G. P. Putnam's Sons, New York.

*Principles of American Forestry.* By Samuel B. Green. 334 pages. Price, $1.50. John Wiley & Sons, New York .

*Yearbook* of the United States Department of Agriculture, 1902. Washington, D. C.

*Specifications for Portland and Natural Cements and Portland-Cement Concrete.* Price, 10 cents. American Railway Engineering and Maintenance of Way Association, Modadnock Block, Chicago.

*Mechanical Engineer's Pocket-Book.* By D. Kinnear Clarke. Fifth edition, revised and enlarged by H. H. P. Powles. 692 pages, 96 figures. Price, $3. D. an Nostrand Co., New York.

*Acetylene; the Principles of Its Generation and Use.* By F. H. Leeds and W. J. A. Butterfield. A practical handbook on the production, purification and subsequent treatment of acetylene. An English book. Illustrated, numerous tables, 276 pages. Cloth, $2. D. Van Nostrand Co., New York.

*The Mechanical Engineer's Reference Book.* By Henry Harrison Suplee, M. E. A handbook of tables, formulae and methods for engineers, students, engineers and draughtsmen. Illustrated. Limp leather, $5 net. D. Van Nostrand Co., New York.

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### Periodicals

The issue of *The Forum* for the last quarter of 1903 contains an article by C. B. Gilbert on *The Administration of Public School Systems.* The author claims that the school system of the city is "a business organization of great magnitude and immense importance," but thinks that the school administration of most cities falls so far short of very plain and simple business principles that it is absolutely incompetent. Were private business managed along such lines, it would surely fail. The trouble is due largely to bad methods, which originated when public schools were first started, and have never been changed. One great cause of trouble lies in the fact that the boards of education are usually composed of a large number of persons who make up an innumerable number of committees, each one of which looks after some special work. The members are selected with no respect to their knowledge of the work which they are to carry out, and are often in need of the very school work which they are to manage.

The author tells of members he has known who were not able to read the text books which they selected; others were charged with the duty of building school houses who were not able themselves to make a respectable living. The whole trouble lies in the fact that, unlike large business undertakings, no responsibility is placed upon any one man. The author holds that the school board should place one man in charge of the business management of the schools, and another should be responsible for the administration of the educational functions. The former should recommend what buildings,etc., are needed, and should be permitted to make contracts subject to the approval of the school board. The latter should have power to select the course, determine what text books should be used, employ the teachers, etc.

In this way, the responsibility for success or failure of the school would rest upon one man in each department, and success would be more certainly assured, provided these men were not hampered in their work. The school board would, of course, have supervision over the acts of these men. This method would be similar to that in vogue in large business corporations, and would go far towards eliminating the wastefulness that is so evident in school management at present.

While Mr. Gilbert cites instances where some superintendents of schools are really in charge of the work, he claims that it depends more upon their personal force than upon statutory powers granted them. In his opinion, the law should grant school superintendents the power of carrying on their work unhampered by the boards, so that politics and influence would have nothing to do with the work of the superintendents. In his opinion, also, school finances should be kept separate from general municipal finances, and the amount to be raised should be determined upon by statute. The board of education should have the responsibility both for raising and spending the money needed for schools, and so would be responsible to the people. New York, N. Y. Price per year $2.

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The *Proceedings* of the American Society of Civil Engineers for October contains the following articles in the municipal field: *Methods of Making Concrete Impervious to Water,* by Sanford E. Thompson; *An Experimental Study of the Resistance to the Flow of Water in Pipes,* by Messrs. E. G. Coker and George H. Fenkell; *Sewage Purification,* by L. J. LeConte; *The Levee Theory on the Mississippi River,* by Messrs. Thomas, Richardson and Harrod. New York, N. Y.

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In the *Journal* of the New England Water Works Association for September appears the Water Works Statistics for the Year *1902,* compiled by Charles W. Sherman, editor of the *Journal.* The statistics include seventy-five cities. Other articles are *The Folly of Reckoning by Gallons Which Differ Widely in the United States and Canada, When all Countries Have Identical Liters and Cubic Meters,* by Frederick Brooks; *Municipal Use and Waste of Water,* by John Venner; *History and Description of the Montreal Water Works,* by George Janin; *Service Boxes of the Montreal Water Works,* by T. W. Lesage; and *The Lawrence Filter,* by M. F. Collins. Boston, Mass. Price per year, $3. Issued quarterly.

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*Public Works* for October contains a number of interesting articles. William Naylor, F. C. S., C. E., contributes *The Profit Side of Refuse Destruction,* a long article illustrated with numerous diagrams of destructors. *Construction and Control of Public Highways in Norway* is the subject of an article by Joh. Skougaard, chief engineer of Norwegian Highway Board. It is finely illustrated. *The Bridges and Roads of France* is an article by Henri Chabal. Henri Mazet describes the *City Hall of Tours* (France) and E. Putzeys, chief engineer of Public Works of Brussels, talks about *Brussels Water Supply Problems.* London, Eng. Price per year, $4.50.

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Three articles in *The World To-Day* for November, are of interest to city officials. There are: *Shall We Have Public Ownership or Public Control,* by Richard T. Ely; *Character Sketch of Denver,* by Eltweed Pomeroy; and *Denver's Rejected Charter,* by James E. Le Rossingol. The last tells how the new charter proposed for Denver was drawn up and later voted down by the citizens. Some of its general provisions are given. Its defeat is laid to the bitter animosity of influential citizens whose financial interests were put in jeopardy by the charter. Chicago, Ill. Price per year, $3.

♣

The November issue of the *American Review of Reviews* tells the story of *Galveston's Great Sea Wall,* showing how the citizens of the stricken city raised $1,500,000 to construct this great defense against the sea. Illustrations show the size of the wall and its general form. New York, N. Y. Price per year, $2.50.

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Charles Zeublin contrubutes to the November *Chautauquan, The Making of the City,* in which he points out the numerous instances where different cities are reaching toward the ideal city. He says that "the making of the new city will mean the making of a new citizen, and the process is in no sense visionary." Springfield, O. Price per year, $2.

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*Insurance Engineering* for October has an article on *The Boston of the Present* in which it is stated that "Boston ranks among the first cities of the country from a fire-protection standpoint." It gives a brief account of the facilities for fire protection and extinguishment. New York, N. Y. Price per year, $3.

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In the *Iowa Engineer* for September appears an article by L. H. Moore and P. R. Bissell, on the *Cost of Electric Street Lighting in the City of Ames.* It describes the power plant and gives statistics from which the cost of light is deducted. The cost of arc lamps per year is given at $75.36 and of incandescents at $15.60. Ames, Ia. Price $1 per year.

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*The Fallacy of Public Ownership* is the leading article in *Gunton's Magazine* for November and attempts to show that "there is no aspect of the subject in which public ownership, especially in complex productive industry is superior or likely to be as good as private ownership." New York, N. Y. Price per year, $1.

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In *Cement* for November is a reprint of the *Regulations of the Bureau of Buildings of the Borough of Manhattan, New York, in Regard to the Use of Concrete Steel Construction.* A report is also given of the *Cement Tests* made by the Metropolitan Street Railway Company of New York using Portland cement. A serial on *The Constitution of Portland Cement,* by Clifford Richardson, is continued in this number. Progress Pub. Co., New York, N. Y. Price per year, $1.

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*The Results of Reform in New York City.* By Gustavus Myers, in *The Independent* for October 22. New York, N. Y.

*Village Improvement Movement.* By Parris T. Farwell. *Ethical Record* for November.

*A Great Municipal Reform.* By Barton T. Hendrick in *The Atlantic* for November.

*Sanitation and Politics.* Annual report of the San Francisco Board of Health in *The Sanitarian* for November. Brooklyn, N. Y.

*Sewage Pumping Plant.* Description of a sewage pumping engine constructed for the Melbourne and Metropolitan Board of Works. *The Engineer,* London, Eng., Aug. 21, 1903.

*Lowesloft Municipal Electric Tramways.* Description of the same with illustrations. *Tramway and Railway World,* Sept. 3. London, Eng.

*The Later Processes for the Manufacture of Water Gas.* By A. Humbolt Sexton in *The Engineering Magazine* for November. Description of a process securing a betterment in the economy and value of the product. New York, N. Y. Price, $3 a year.

*Candle Power Tests of Welsbach Burners.* Abstract of the report of N. E. L. A. Committee on Investigating the Photometric Value of Arc Lamps, which deals with the tests of mantle gas burners and of the naked gas flame. *Electrical World and Engineer,* Oct. 31, 1903. Price, $3 a year.

*New Electricity Works of the Manchester Corporation. Electrical Review,* Sept. 18, London, Eng.

*Resistance of Road Vehicles to Traction.* Report of the committee of the British Association for the Advancement of Science. *Engineering,* Sept. 25, London, Eng.

*The Siemens and Halske Fire Alarms. Scientific American Supplement.* Sept. 19. New York, N. Y.

*The Six-Inch Macadam Streets of Hudson, N. Y.* By H. K. Bishop in *Engineering News,* Oct. 8. New York, N. Y.

*The Sanitary Disposal of Municipal Refuse: An Internal Discussion. Transactions* of Amer. Society of Civil Engineers, Vol. 50. New York, N. Y.

*Mixing and Placing Concrete.* S. H. Lea, C. E., in *Mines and Minerals.* Serial, beginning in October. Scranton, Pa.

*The Filtration Works of the East Jersey Water Company at Little Falls, N. J.* George W. Fuller, C. E., in *Transactions* of Amer. Society of Civil Engineers, Vol. 50.

# ACETYLENE FOR MUNICIPAL LIGHTING

## Cost So Reduced That Every Town Can Own and Operate Its Own Plant—An Ideal Illuminant for Small Towns and Cities

The lighting of a village of 1,000 inhabitants is a different proposition than supplying light to large cities, yet there is no reason why the inhabitants of the small village should stumble along poorly lighted streets when the feeble kerosene lamps can be replaced by other lights of far greater candle-power and at little increased nominal expense. When taking into consideration the many advantages to be derived from well lighted streets, the balance is on the side of the well lighted streets. What shall be the substitute for kerosene is the question, and experience has shown that in acetylene is found a medium whose cost is nominally but a little above that of the oil, while its illuminating power is many times that of the latter.

When an acetylene plant is properly designed and carefully installed and a daily average consumption of fifty cubic feet of gas is assured for each $1,000 invested, a plant will be a safe investment for any place. The generator house can be so designed as to present an attractive appearance, and, as the by-product of lime is not at all offensive, the plant would not be considered a nuisance if located in any section of a town.

The ideal system of generation for any large installation is one in which the storage holder is slowly filled by an independent automatic carbide feed generator. By using the automatic generator and properly gauging the opening through which the gas passes to the storage holder, the presence of an attendant will not be necessary during the period of generation of the gas and, consequently, there will be no desire on his part to hasten the process whereby he would cause loss both in quantity and quality of the gas produced. All the pipe lines and fittings should be of galvanized iron because the gas is able to percolate through wrought iron. While acetylene is not affected by any ordinary extremes of temperature, such as would be met with in pipes laid under street surfaces, pipes should be placed far enough down to ensure a fairly even temperature, eighteen inches below the frost line being sufficient.

TOWN ACETYLENE PLANT AT SO. HADLEY, MASS.

Local conditions somewhat vary the distances between street lamp posts, but when the posts are placed not to exceed 300 feet apart and alternately on opposite sides of the street, satisfactory and economical results are obtained. With this arrangement of posts, the standard one-half foot burner is satisfactory, except at prominent street corners where the three-fourth foot size of burner may be used. A combination of three-inch pipe as a base with two-inch pipe for the upper section makes a very neat and inexpensive post. The posts should be set in concrete, or, as a cheaper substitute, a heavy wooden block may be bored to receive the base of the post and buried beneath the frost line.

The cost of installing and running an acetylene plant will, of course, vary according to the locality and character of the town, but taking as an example a village of 1,000 inhabitants and embracing about four miles of streets within the lighted district, a fair average cost will be about as follows:

| | |
|---|---|
| Generating plant and buildings | $2,800 |
| Pipe, fittings, etc. | 3,800 |
| Trench, at $1.80 per rd | 2,304 |
| Sixty street lights, set and connected | 840 |
| Incidentals | 400 |
| Total | $10,144 |

Such an estimate is based on the assumption that a generating plant of ample proportions is installed and the soil to be excavated comparatively free from rock.

Acetylene is generally sold at 1½ cents per cubic foot, and will cost in most cases one-half as much again as the kerosene used in the same place. Therefore, the cost of kerosene in cents will about equal the number of feet of gas which would be consumed in the same place during the same period. A one-half foot burner lighted on dark nights only and extinguished at midnight, will consume about 600 cubic feet of acetylene gas in the year. The cost of producing one cubic foot of acetylene will vary with the cost of transportation of carbide; but in any case, the cost should not exceed 0.008 cents. Therefore, the cost of the gas consumed by one street light burning on the above schedule will be approximately $4.80.

With an electric plant the wear and tear is practically as great with the minimum as with the maximum load, while with the acetylene plant there are practically no moving parts to wear out and the chief item of expense is the carbide which is used only as it is required. Consequently, the cost is at all times in direct proportion to the consumption of gas.

## New Field for Sand-Lime Brick

It is interesting to note that the sand-lime brick industry, which has made such giant strides in the building brick line in this country in the past few years, has invaded the paving brick field. The results, it is claimed, have been so favorable as to preclude the possibility of a doubt as to any failure in the use of this remarkable product for such purposes. To substantiate this claim the H. Huennekes Company, who are said to be the originators of the industry in America, have furnished the MUNICIPAL JOURNAL AND ENGINEER with the accompanying cuts, showing two sidewalk pavements, laid in Sioux Falls, S. D., made from brick manufactured at the plant located in that city.

In the construction of these pavements it will be noticed that, in one instance, the bricks were laid on edge, and, in the other, flat. These pavements were laid in the summer of 1902, and at the time the photographs were taken, in the spring of 1903, the pavements had been in constant use up to that date, and had withstood the rigors of the severe winter in that latitude. The camera will permit of no deception and it only requires a glance at the illustrations to assure oneself of the evenness and perfect condition of the pavements. Those who have examined the pavements themselves say, "there are

SAND-LIME BRICK SIDEWALK IN SIOUX FALLS, S. D.—LAID FLAT

no signs of disintegration, and the bricks are, to all appearances, firmer and more durable now than when laid."

"Taking into consideration," said a well known engineer who had investigated this new process of brick making, "the composite formation and the high crushing resistance of the sand-lime brick, together with its well known low absorbtive qualities, it can be readily seen that, as a factor in the paving brick industry, it is to be no longer overlooked. It is possible, and, indeed, highly probable, that we may find in the sand-lime paving brick a satisfactory solution of some of the difficulties hitherto not overcome in this extensive industry."

The H. Huennekts Company, 114 Liberty street, New York, will be pleased to answer any inquiries. This Company has put in operation, during the past year, upwards of twenty sand-lime brick factories. Some of the plants are manufacturing building stone and rock faced ashler blocks from the same materials used in the making of brick and by the same process.

## An English Earl's Opinion

The English, next to the Americans, are the greatest travelers in the world, and while they as a rule insist upon having the best there is to be obtained, they appreciate good service and beautiful scenery. The Earl of Shaftesbury, having, with his wife, spent some little time in the United States during the summer, speaks most enthusiastically in regard to what they have seen. A few days ago he said to a gentleman in Buffalo:

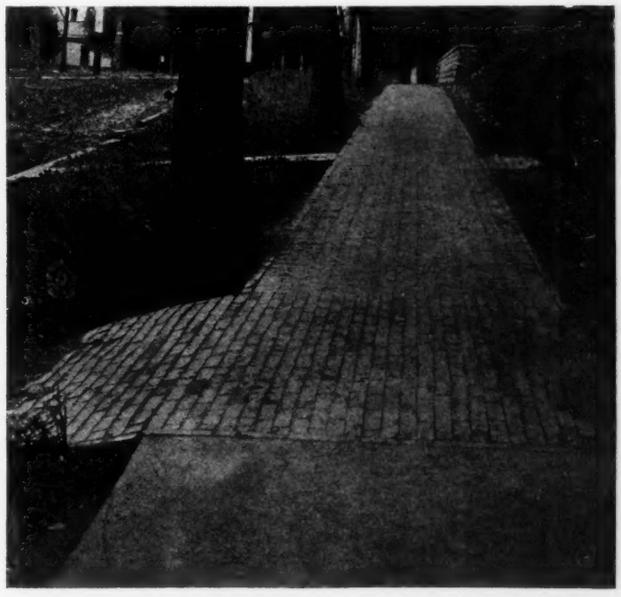
"Our stay in New York was a delightful one, and the picturesque grandeur along the Hudson and its surroundings was a source of much joy to us all.

"It has seldom been my good fortune to pass the time in such excellent sport as that furnished in your enchanting Adirondack Mountains."—From the *Albany Times-Union.*

## Omaha May Lay Its Own Asphalt Pavements

As a result of the questionable tactics and operations of the Barber Asphalt Company in Omaha, that city may install a municipal asphalt plant large enough not only to make all future repairs on asphalt pavements already laid, but also to lay all asphalt pavements in the future. The following quotation from the Omaha *Bee* explains the situation:

"Hostilities between the city council and the Barber Asphalt Company have not been sweetened any by recent unofficial acts of one of the local representatives of the trust.



SAND-LIME BRICK SIDEWALK IN SIOUX FALLS, S. D.—LAID ON EDGE

"In the fight made to prevent the payment of bills incurred in municipal repairs to asphalt, letters have been written to the bonding companies, sureties for the councilmen, advising that the lawmakers will be held responsible on their bonds for the amounts paid.

"After an investigation the surety companies declined to cancel the bonds.

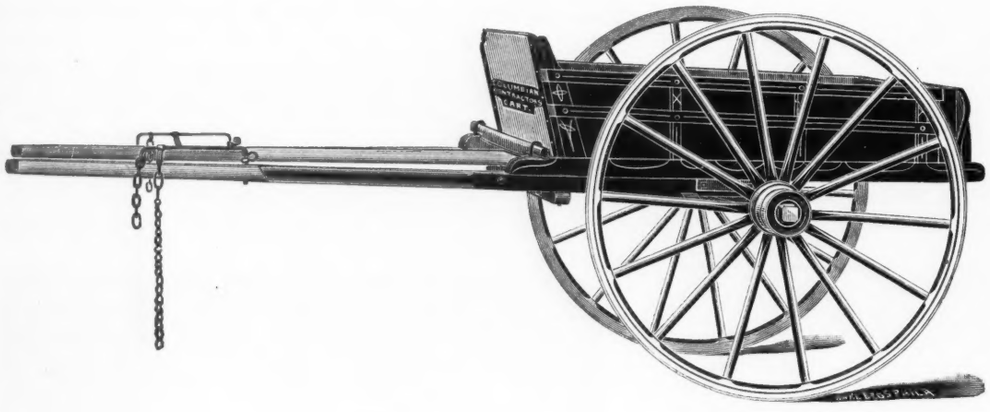
" 'I do not fear the concellation of my bond,' said one of the councilmen, 'as I could get personal surety without trouble, but the method used arouses my resentment. It will not help to heal the breach between the Barber Company and the city, and will have an effect toward the construction of a municipal asphalt plant. Instead of confining itself strictly to repairs, as was at first proposed, you may see Omaha laying its own asphalt pavements. There seems to be little or no question, in view of the work done this season, but that the city can put down asphalt paving better and cheaper than has been obtained by contract.'

"Considerable asphalt paving in the business district is yet to be repaired, but has been delayed by the slow arrival of material from the west."

## City and Contractor Carts

Now that cities are adopting the day labor system and performing work hitherto awarded to contractors the necessity for becoming interested in tools, implements and apparatus with which the work is done is the more imperative. For this reason, various city officials will be pleased to learn something about the products of the Columbia Wagon Company, Columbia, Pa.

This concern manufactures a full line of heavy wagons and carts, some of the latter being especially adapted for city work. It has a



THE "COLUMBIAN" REGULAR CONTRACTORS' CART

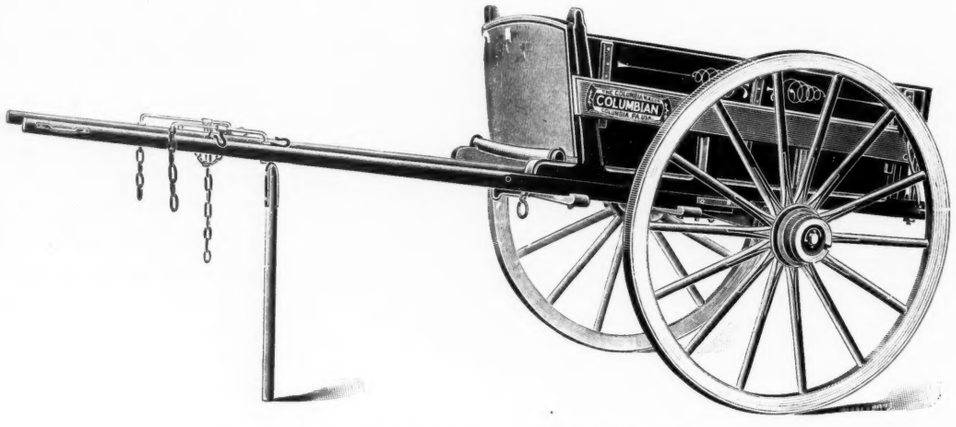
reputation for using the best materials which has been well sustained by honest trading since its inception, ten years ago. Its guaranty is all that could be desired, and, as stated by the concern itself, reads as follows:

"We guarantee our gun-metal axles against breakage, and will replace free of cost, if broken, no matter how heavy the load or under what circumstances they may be broken.

"We warrant the balance of our wagon for one year with fair and reasonable use. If any parts fail by reason of imperfect materials or workmanship, we will replace the same free of charge on receipt of the defective part at our factory All repairs are charged as sent out, and credited when defective parts are returned to us.

The accompanying cuts show the "New Combination City Contractors' Cart" and "Columbian Regular Contractors' Cart." The former is used for city work entirely. It is built extra heavy and is good for the hardest service. A large number are now in use on the Philadelphia Subway—it would be difficult to find a place where the cart would receive harder usage than there. These are carried in four regular sizes, but special sizes will be made to order. The capacity of the regular sizes range from 1,800 pounds to 4,000 pounds, and the weight of the carts from 700 to 900 pounds. The "Regular Contractors' Carts" are made in four sizes also, but special sizes will be made to order promptly. The capacity of the regular sizes range from 1,800 to 4,000 pounds, and the weight of the carts, from 500 to 800 pounds.

A large illustrated catalogue will be sent to any address upon request and the concern will be glad to submit bids or estimates at any time.




THE NEW "COLUMBIAN" CITY CONTRACTORS' CART

## Items of Interst about the Trade

—A delegation of city officials from St. Louis recently visited Minneapolis to inspect the Decarie Crematory, which has been in operation in that city for a year or so. The delegation was unanimous in its approval, not only of the work of the plant, but of the sanitary condition about it, and particularly of the absence of any unpleasant odors.

—The city of Duluth recently purchased a mixing plant from the Toledo Construction and Supply Company, which it proposes to use in the construction of some of its streets.

—The American Road Roller Company, with Executive Offices at 156 Fifth avenue, New York, and works at Groton, N. Y., has recently sold Oastler steam rollers to Richfield Springs, N. Y., Corinth, N. Y., South Orange, N. J., Salamanca, N. Y., and Superior, Wis. It has also sold its A. B. C. road and pavement scraper to Richfield Springs and Corinth, N. Y.

—The Seagrave Company, of Columbus, Ohio, recently delivered to the city of Newport one of its latest and best hook and ladder trucks. But a short time before a similar truck was shipped by the same company to the city of Fitchburg, Mass.

—The Allis-Chalmers Company, Chicago, has secured the contract for the engines to be installed in the additional sub-stations for the Sydney, New South Wales, electric traction system.

—In connection with the installation of the new sewer system for New Orleans, La, the first automatic flushing tank was recently installed. It was of the Miller type and made by the Pacific Tank Co., 84 LaSalle St., Chicago.

—The Buffalo Pitts Company, Buffalo, N. Y., recently sold another of its steam road rollers to the park department of Springfield, Mass.

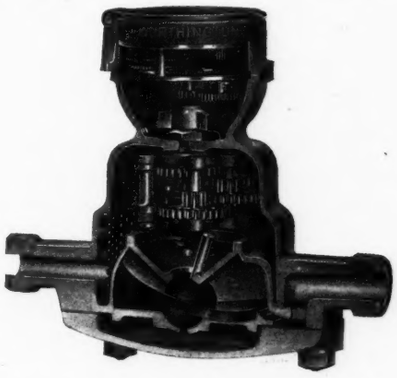
—The Diggs Fire Extinguisher Company, New York, has been appointed general agent for the patent hose drier made by the American Hose Drier Company.

—Mr. Irving H. Reynolds will shortly retire from the Allis-Chalmers Company, and the duties of chief engineer will be assumed by the engineers in charge of the various departments, these engineers availing themselves of the advice of Mr. Edwin Reynolds, consulting engineer of the Company.

## A New Disc Meter for Water Service

WATER meters are now considered a necessary adjunct in the economical administration of a water works plant. The time was when they were looked upon with suspicion, but now the intelligent waterworks superintendent urges their installation not only upon manufacturing plant services but domestic services as well. For this reason, anything new in the water meter line is sure to interest the readers of the MUNICIPAL JOURNAL AND ENGINEER, and it is by the courtesy of the makers that the following description of the new Worthington disc meter is given.

In this meter a light disc, formed of hard rubber, is placed in a



compartment which may be approximately described as a hemisphere with a spherical segment taken out of the top. A slit cut in the disc upon one side fits over a vertical radial septum in the disc chamber. This is clearly shown in the accompanying cross-sectional view of the Worthington meter. The disc itself, as actually constructed, is conical in shape on both the inner and outer surfaces. From the center of the disc a vertical spindle projects through a circular opening in the disc chamber and its upper end rests against a circular block. It is thus constrained to move in a circle.

Now, it will be seen by examining the cut and considering the possible motion of the disc that there is never a free opening between the water inlet passage and the outlet, but that the disc is always interposed. However, since the water pressure is admitted to one side, if the pressure of the exhaust is any less, the disc will be caused to tip, resulting in an increase in the volume of the portion of the disc casing opening to the supply and a decrease in that opening to the delivery. The continuation of this motion causes the vertical spindle to travel in a circular path, while the disc itself may be said to "wobble." The motion of the vertical spindle is reduced by an intermediate train of four gears, which operates a slow moving spindle extending through a stuffing box in the top of the meter casing. This spindle in turn operates the gears moving the counter. This counter may be either of the pointer-and-dial type or the straight reading type, and may be arranged to indicate in cubic feet, gallons, liters, etc., as required.

The Worthington meter has been designed by one of the most experienced meter designers and engineers in the country and is compact and attractive. It is constructed throughout of bronze composition, except the bottom plate, which may be of bronze or iron, as preferred. An interior strainer is part of the regular construction and connections are furnished as desired. There is no unbalanced water pressure upon the moving disc except that operating to move it, and its wear is therefore reduced to a minimum and easy movement and great accuracy secured. The disc is cut from a solid piece of hard rubber instead of being built up.

While Henry R. Worthington, 114 Liberty St., New York City, manufactures the only piston meter on the market, and is now selling more than ever of that type, extensive preparations have been made to manufacture the new disc style of meter, a new shop equipped with special machinery having been built for its production alone. All parts are made interchangeable, so that several hundred meters of the same size can be dismantled, the parts mixed up and an equal number of meters made up without the slightest difficulty in fitting. All meters are tested for accuracy at 150 pounds water pressure before leaving the factory.

## Record Freight Run

New York Central officials yesterday made public the running time of a freight train loaded with export cotton, which it was said holds the freight record between Montreal and New York. The train made the 435 miles between Valleyfield, Quebec, and New York in 16 hours and 20 minutes.

Two hundred bales of Egyptian cotton were in store at Valleyfield, a few miles south of Montreal. They had been sold to Liverpool spinners and in order to make delivery it was necessary to get the cotton to New York within seventeen hours.

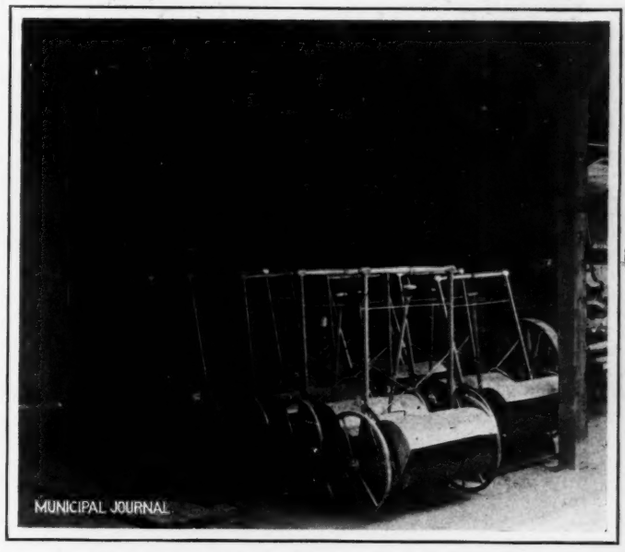
One of the railroad traffic officials in speaking of this run said that it was significant in showing that the Canadian rail and ocean service was wholly inadequate in cases of emergency when certainty of delivery is important. From this it was maintained that the trunk lines are in absolutely no danger of losing their prestige to the Grand Trunk or the Canadian Pacific.—From the *New York Herald.*

## The Hand Pick-up Street Sweeper

WASHINGTON, D. C., has employed the small hand pick-up street sweeper to good advantage. It has also been used in Columbus, O.; Baltimore, Md.; Buffalo, and Rochester, N. Y.; Fort Wayne, Ind.; and Indianapolis, Ind.

The accompanying illustration shows the machine used by Columbus. Wherever they have been used they have given excellent satisfaction. The city of Washington uses them in preference to every other method, and the street cleaning superintendent speaks in the highest terms of their efficiency and economy.

This pick-up hand street sweeper is made by the Sanitary Street Sweeping Co., of Washington, D. C. It is constructed on scientific and mechanical principles and has been in use long enough to warrant its universal adoption by street cleaning departments throughout the country. It is easy to operate, free from intricate parts and




ATKINSON STREET SWEEPERS USED IN WASHINGTON, D. C.

thorough in its work. The broom is thirteen inches in diameter and thirty inches long, which is encased in a neat steel covering. It is operated by means of a single gear and the broom picks up the dirt, large and small, found on the street as readily as a carpet-sweeper picks up the dirt from the floor. In Washington, where there are one hundred and fifty of these machines in use, the most satisfactory results are obtained. The city is divided into different districts, each in charge of an inspector, who has immediate charge over the "White Wings" in his district. The average number of square yards per man throughout the resident and business districts to be cleaned is 10,000, and the cost per thousand square yards for cleaning is less than sixteen cents. In the morning two men start out with each machine, one going ahead and with a scraper loosening all the packed rubbish on the street, who is followed by the man

with the machine, which picks up the dirt. When the entire district has been covered by the different machines the extra man takes his brush and cleans up along the curb and looks after the alleys and sides of the streets. With this system it is possible to clean two blocks of pavement before dumping, so that instead of having, as under the old system, six to ten miles of dirt in a block, there will not be over two in each block. In this way easily half of the time of the teams is saved, because they do not have to make short stops in every block. Prices and estimates can be secured on application to the company.

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## What a Conduit Should Be

In construction of an underground system of ducts for use in connection with telephone, telegraph, railway, lighting or power circuits, it is essential that a conduit be used which has the following characteristics:

First. It should be electrolysis-proof.

Second. It should be non-corrosive and proof against any form of deterioration or decay.

Third. Its insulating qualities should be high as possible.

Fourth. The conduit itself should be dry and moisture-proof.

CONGRESSIONAL LIBRARY, WASHINGTON, D. C., WHERE BITUMINIZED FIBRE CONDUIT IS USED

The joints should be water-tight and air-tight, so that gas or water cannot penetrate.

Fifth. The joints should be self-aligning and insure a permanently fixed alignment.

Sixth. All injuries to covering of cables by drawing in and out of subway should be entirely provided against by using a duct which has a round hole with a smooth and strictly non-abrasive inner surface.

Seventh. It should be light in weight to facilitate cheapness in freighting, handling and laying.

Eighth. It should be strong and tough for proper protection of cables and to avoid loss from breakage in shipping and handling.

Ninth. It should be made in long sections or units to reduce the number of joints, thus facilitating rapid and cheap laying.

The Bituminized Fiber Conduit (patented) made by the American Conduit Company, 170 Broadway, New York, has all of these qualities and to a degree which justifies the claim of superiority over any other conduit on the market.

The United States Government uses bituminized fiber conduit in the Congressional Library and in other public buildings, shipyards, etc., because, as one engineer puts it, "It is the best material known and the safest under all conditions."

## Publications Received

—"List of Foreign Engine Users," is the title of a neat 78-page booklet, recently issued by the Allis-Chalmers Company, New York Life Building, Chicago. The booklet also calls attention to the fact that the concern is the largest producer of engines for all power purposes—pumping engines, hoisting engines, blowing engines and air compressors—in the world.

—"Something New in Conduit," is a 4-page leaflet, just issued by The H. B. Camp Company, 170 Broadway, New York. The improvement in conduit making is something novel and worth investigating.

—P. W. Dietly, proprietor of the Erie Machine Shops, Erie, Pa., has issued an attractive 16-page catalogue, which tells all about the steam rollers, asphalt mixers and feed water heaters he manufactures.

—"Switch Boards," is the subject discussed in the October Bulletin, of the D'Olier Engineering Company, Philadelphia, Pa. The story is tersely told and illustrated with some fine half-tones.

—Water works people will be interested in the 10-page, illustrated catalogues published by the Neptune Meter Company, Newark, N. J. It tells about the "New Trident-Crest Water Meter."

—Mr. William C. Oastler, president of the American Road Roller Company, 156 Fifth avenue, New York, is always getting out new and attractive printed matter. His latest production is a handsome portfolio containing large half-tones of the numerous products of this Company's plant, at Groton, N. Y., such as street sweepers, road scrapers, road rollers, etc.

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## Pavements of Paris

The state pays its portion towards the paving of the streets of Paris, and there is usually an annual dispute between the prefect of the Seine and the municipal council respecting the amount of the appropriation for paving and repairing. It is stated that in the year 1185, in the reign of Phillip Augustus, the first was laid in Paris. In the fourteenth and fifteenth centuries, the city assumed charge of the "Paris Cross Roads," while the people inhabiting other streets looked after them. In 1637, the State had charge of these roads, but in 1791 a decree of the National Assembly placed the burden of paving upon the city again. Inasmuch as the city did not have the means for taking care of all this work, grants were annually made from the treasury, and since 1826 the State and the city have divided the cost of paving between them. There are in Paris about 6,315,400 square meters of pavement exclusive of walks and interior courts. This amount includes several kinds of paving; thus, there are the burgois pavements of 1830, consisting of large heavy cobble stones laid in little frequented streets; then there are the modern pavements—municipal stone pavements that come from the quarries opened by the State. Before adopting this kind of pavement, numerous experiments were made, and the arkoses of Autun, hard sand-stones, and granite from the Vosges, and Belgian porphyries were successively treated. They soon found, however, that porphyries were too slippery for horses, and as they were obtained out of the country, they were abandoned. Hard sand-stone, obtained in France, proved to be cheaper because their care was less burdensome and they lasted longer.

The expenses attending the care of Paris pavements have increased gradually; in 1888, they amounted to $1,659,800; in 1890, this had increased to $14,965,606. An enormous amount of traffic, and the increase in population has accounted for this heavy yearly expense.

Three kinds of materials are now used on Paris streets—stone, wood and asphalt. The macadam streets aggregate 1,495,000 square meters, and the expense for the care of them amounts to about $630,000 per year. The average price per square meter is placed at about 43½ cents.

The care of the stone streets is confided to the service of street laborers, as is the case on all of the roads in France. They take charge of the simple repairs, as well as assisting in the reconstruction where it is necessary.

# CONTRACT NEWS FOR THE MONTH

## Including Paving, Sewerage, Water Supply, Lighting, Public Buildings, Sewage and Garbage Disposal, Fire Supplies, Contracts Awarded

***N. B.—All news of proposed work sent us by city officials is incorporated in our Weekly Advance News Service and appears subsequently in this "Contract News for the Month" if the date of the reception of bids be sufficiently late to warrant placing the item here.***

***City officials and others are urged to send us all news of contemplated improvements for use in our Weekly Bulletins which are mailed to those interested.***

### PAVING, PAVING MATERIALS AND MACHINERY

Alameda, Cal.—The estimated cost of macadamizing and improving Webster street was placed at $44,444. City Engineer W. R. Poyzer.

Albany, N. Y.—An ordinance provides for $10,000 worth of macadam on a road from Livingston avenue to the Tivoli reservoir.

Allegheny, Pa.—Bonds in the sum of $28,040 will be issued for the paving of Fleming street according to reports. An ordinance provided for the paving, grading and curbing of Iona street. City Clerk Wills.

Altoona, Pa.—The Council has been considering the paving of several streets with brick. Mayor Hoyer.

Atlantic City, N. J.—It was estimated that the cost of laying brick on Atlantic avenue would be $334,880.

Baltimore, Md.—Calvert street may be widened. Plans have been prepared for several miles of macadam roads in Baltimore County.

Bay City, Mich.—The Council has been considering the paving of several streets. Mayor F. T. Woodworth.

Beaumont, Tex.—The County Commissioners will issue $100,000 county road bonds.

Bellefontaine, O.—The roads in Richmond township will be improved by December 7, 1903. J. W. Vankorn.

Belleville, Ill.—South Illinois street will be paved with brick at a cost of $31,493, and West Main street at a cost of $57,492. City Engineer Louis Graver.

Champaign, Ill.—The cost of paving Prospect avenue will be about $24,800.

Cincinnati, O.—Ordinances called for the grading, curbing and paving of three streets with brick, and of two streets with granite block.

Coffeyville, Kan.—The question of paving has been under discussion.

Colorado Springs, Col.—It was stated that an automobile boulevard was to be constructed at a cost of about $80,000.

Columbus, Ga.—Resolutions called for eighteen blocks of cement walks on Third avenue.

Crookston, Minn.—Bids were asked on November 30 for $35,000 paving bonds. City Clerk W. H. Graver.

Decatur, Ill.—It was reported that about two miles of asphalt would be laid.

Detroit, Mich.—The Department of Public Works has ordered a large number of walks to be laid by property owners. Commissioner W. H. Maybury.

Duluth, Minn.—East Michigan street is to be extended. Fifth street paving has been under discussion. Board of Public Works.

Elroy, Wis.—Bids are wanted on December 1 for about 9,890 square yards of brick paving, and about 3,800 feet of concrete curb and gutter. City Clerk Dix.

Erie, Pa.—An ordinance provides for the issue of $70,000 bonds for paving.

Freeport, Ill.—Will pave several streets with brick and macadam at an estimated cost of $100,000. K. W. Graham, City Engineer.

Galveston, Tex.—It has been proposed to pave Market street. Mayor Austin.

Geneva, N. Y.—It is stated that a boulevard will probably be built. President Van Anken, Board of Public Works.

Globe, Ariz.—The construction of a wagon road to Tout's dam at a cost of $100,000 has been under discussion.

Grand Rapids, Mich.—West Leonard street will be graded and paved with brick. City Clerk Boer.

Hampton, Va.—$25,000 it is said will be spent on improving streets. The Mayor.

Haverhill, Mass.—$5,000 has been appropriated for the laying of wood block pavement on Haverhill Bridge.

Hickory, N. C.—It has been voted to issue $90,000 in bonds for street improvements, water works and sewers.

Hoboken, N. J.—Mayor Lankering is anxious to have the streets and sewers put in good condition.

Houston, Tex.—It was stated that new bids would be asked for brick paving on three streets. Fifty streets were to be paved at a cost of $300,000. City Engineer Dormant reports that a number of streets are in bad condition.

Jackson, Tex.—Bonds have been voted for street improvements. The Mayor.

Kansas City, Mo.—Resolutions call for repairs to various streets.

Kenton, O.—An ordinance was passed for the paving of North Detroit street.

Lansdowne, Pa.—It is stated that several roads will probably be macadamized next spring. City Engineer Robert Green.

Logan, Utah.—Petitions have been circulated calling for the paving of Centre and Main streets.

Lowell, Mass.—Council has appropriated $26,000 for the laying of macadam pavements.

Marion, O.—An ordinance calls for the improvement of Bellefontaine avenue. Resolutions called for sidewalks on Reed avenue.

Moorestown, N. J.—It is stated that Central avenue will probably be paved with concrete.

New Brunswick, N. J.—Bids are wanted December 23 for six miles of macadam road from this place to Kingston.

Pawtucket R. I.—Resolutions called for the issue of $18,000 bonds for improving four streets.

Peoria, Ill.—The paving of three streets with brick has been under consideration.

Portland, Ore.—Will lay 5,000 square yards on Salmon street with wood block on concrete at an estimated cost of $15,000. City Engineer Elliott.

Quincy, Mass.—Part of Willard street will be paved at a cost of $6,000.

Red Lodge, Mont.—Carbon County may be bonded in the sum of $30,000 for road and bridge improvements. Commissioner Nutting.

Rutherford, N. J.—The Council has been considering the laying of brick on Park avenue.

St. Joseph, Mo.—Proposed ordinance called for the reconstruction of asphalt on South Sixth street.

St. Paul, Minn.—An ordinance called for the paving of Ogden street, and the repaving of several others. R. L. Gorman, Clerk.

San Antonio, Tex.—It was stated that Improvement District No. 2 would issue $30,000 bonds for paving. W. S. Conness.

San Francisco, Cal.—Plans were approved for the extension of Little Main street at a cost of $21,000.

Shelbyville, Ill.—$30,000, it was stated, would be spent on paving.

Stonington, Conn.—It was voted to lay block paving on West Broad street at a cost of $5,000.

Somerville, N. J.—Bids are asked on December 1 for macadamizing eight miles of road. W. J. Hogan, Director.

Tampa, Fla.—A vote was to have been taken on the issue of $215,000 for paving, sewers, etc. The Mayor.

Toledo, O.—$11,087 worth of bonds has been issued for paving various streets.

Toronto, Ont.—City Engineer Rust recommended asphalt paving on various streets to cost $6,500.

Upper Sandusky, O.—$60,000 bonds were reported issued for paving.

Washington, D. C.—The Commissioners will ask Congress for $500,000 for paving work.

Wheeling, W. Va.—The cost of paving Sixteenth street was placed at $14,055. City Engineer Cooke.

Windsor, Ont.—It was voted to issue $56,000 bonds for granolithic walks. City Clerk J. C. Guillott.

#### Contracts Awarded

Albany, N. Y.—Robert Shafer has the contract to improve Sherman street and Clinton avenue at $17,119.

Allegheny, Pa.—Contract let the Pennsylvania Asphalt Co., Pittsburg, for repairing asphalt pavements at $1.94 per squars yard, including excavating, concrete and two-inch sheet asphalt. Small contracts for paving, sewers, grading and curbing were let to numerous contractors. Director of Public Works.

Atlanta, Ga.—Venable Brothers were low bidders for paving of North Pryor street with asphalt.

Bergenfield, N. J.—Contract was awarded B. J. Whittaker for macadam on Palisade avenue at $1,898.

Boise, Idaho.—Contract for asphalting Main street let E. K. Taylor & Son at 70 cents per square yard.

Bowling Green, O.—Contract let C. J. Miller & Co., Toledo, for about five miles of macadam road in Wood County at $25,000.

Brooklyn, N. Y.—The low bidder for paving and grading the plaza at the Williamsburg Bridge was United Engineering & Contracting Co., 15 Park Row, New York, at $98,745.

Buffalo, N. Y.—Bids for the reasphalting of Perry street were made by the Barber Asphalt Co. at $8,161. H. P. Burgard bid for asphalt $7,785 and for brick $12,750. The Barber Asphalt Co. was low bidder for the paving of Peoria street and Washington street.

Burlington, N. J.—Contract awarded M. S. Lynch for McAvoy brick pavement on West Pearl street at $14,793.

Cadiz, O.—Contract awarded E. Brentlinger for the construction of Honeyman pike at $11,550.

Camden, N. J.—Contract let W. H. Sherman for stone block on two streets at $1.70 a square yard.

Cape May, N. J.—Contract awarded R. E. Hand for rebuilding Ocean City turnpike at $25,420.

Celina, O.—Contract let the Lake Erie Asphalt Block Co. for paving at $25,000.

Champaign, Ill.—Contract awarded Wm. Konkey for 11,295 square feet of cement walks.

Cincinnati, O.—Contract awarded the Barber Asphalt Co. for paving Fern street at $14,958, and the Kircher Construction Co. for three streets at $22,557. Contract let Delaney & Goodman for macadam repairing on two streets at $12,998.

Columbus, O.—Contract awarded the Barber Asphalt Co. for paving Broad street at $22,818. Contract let D. E. Sullivan & Co. for paving First avenue with Nelsonville brick. Contract awarded Cleveland Trinidad Asphalt Co. for paving Eighteenth street at $4,871.

Denver, Col.—Contract was awarded the Colorado Paving Co. for asphalt on Twentieth avenue at $20,396.

Des Moines, Ia.—Contract awarded the Barber Asphalt Co. for $15,000 square yards on Thirteenth street at $2 per square yard.

Dunkirk, N. Y.—Barber Asphalt Paving Co. has the contract for $75,000 worth of paving.

Elgin, O.—Contract awarded Baldwin Bros. & Graham for paving North Chestnut street and West River street.

Elyria, O.—Snow, Schultz & Eason were low bidders for paving North Chestnut street at $5,490.

Frederick, Md.—Contract awarded Fritchey & Son, Lancaster, Pa., for paving a portion of Market street at $4,540.

Greenville, Miss.—Contract awarded Southern Paving & Construction Co., Chattanooga, Tenn., for brick paving on eight-inch concrete.

Hoboken, N. J.—Callery & Murphy submitted the lowest bid for brick paving on High street at $43,126.

Iola, Kan.—J. D. Hanley, Topeka, received the contract for 53,000 square yards of brick paving at $1.70 per square yard.

Kansas City, Kan.—The Gilsonite Roofing & Paving Co. bid $9,239 for asphalt paving on Walrond avenue. City Engineer Pike.

Lafayette, La.—Contract awarded J. E. Massicot for concrete walk at 17 cents per square foot.

Lakewood, O.—Cleveland Trinidad Paving Co. was low bidder on macadam for Lake avenue at $58,096.

Lockport, N. Y.—Contract awarded Johnson & Mumm, Buffalo, for concrete steel floor with brick pavement on Miami street bridge at $9,975.

Marion, O.—Perry Dawson has the contract for Buckeye block on Garden street at $1,867.

Medford, Ore.—Contract E. G. Perham for a road from Swayne Ford to State line.

Memphis ,Tenn.—Miller Paving Co. has contract for 10,000 square yards of paving on Charleston avenue.

Moline, Ill.—Contract awarded Tri-City Construction Co., Davenport, for paving three streets at $21,680. Barber Asphalt Co. has contract for paving Eleventh avenue at $10,890.

New York, N. Y.—Asphalt Construction Co. was low bidder for asphalt on plaza at Fifth avenue and 110th street.

North Stonington, R. I.—Contract let Edward McKnight, Westerly, for two miles of State road; also to Wm. F. London, Westerly, for three miles of road.

Norwalk, Conn.—Low bidder for grading and roadway on Westport avenue was C. M. Blakeslee & Sons, New Haven, at $16,000.

Oakland, Cal.—Contract E. B. & A. I. Stone, 900 Broadway, for paving Frintvale avenue at $3,150.

Omaha, Neb.—Contract let Hugh Murphy, Bee Building, for paving Military avenue with granite at $3.50 per foot.

Pekin, Ill.—Dunbar & McAlister were the lowest bidders for brick pavement on North Third street at $1.32 square yard.

Reading, Pa.—Bids for repairs to asphalt streets made by Toledo Construction Co., Toledo, at $1.74 square yard for asphalt, $4.50 for concrete.

Rochester, Ind.—Hugh Woods & Co., Decatur, received the contract for brick paving on twelve streets at $1.58 per square yard.

St. Paul, Minn.—Contract awarded Austin-Western Co., Chicago, for a stone crusher at $1,075. Fielding & Shepley, 217 West University avenue, has a contract for paving Temperance street at $8,855.

Schenectady, N. Y.—The Schenectady Construction Co. has the contract for paving five streets.

Streator, Ill.—J. S. Baer bid $1.18 per square yard for 5,900 square yards of brick paving, and 42 cents per lineal foot for 4,500 feet of Berea sandstone curb.

Walbrook, Me.—Contract awarded Chas. A. Hook for macadam on three streets at $11,415.

Warren, O.—Contract awarded Andrew Colucci, Youngstown, for asphalt paving on three streets at $30,000.

Wilmington, N. C.—Contract for paving Market street with Georgia block awarded Coal, Cement & Supply Co. at $1.815 per square yard.

York, Pa.—Contract let York Macadamizing & Grading Co. for macadam on various streets at $1.14 per perch. W. H. Duttera has contract for one street at $1.20 per yard. John Stover received contract for grading and paving three streets at $1,300.

## LIGHTING AND TELEPHONE

Atlantic City, N. J.—It was reported that the Coast Telephone Co. would spend $300,000 in placing its wires underground.

Belzoni, Miss.—It was voted to issue $20,000 bonds for water works and an electric light plant. The Mayor.

Benton, Ark.—The city contemplates putting in an electric light plant. The Mayor.

Bessemer, Ala.—The National Gas Co., New York, was to ask for a franchise for a plant here.

Brunswick, Mo.—It was voted to issue $5,000 bonds for enlarging the electric light plant and water works.

Buena Vista, Ga.—The installation of an electric lighting plant is favored.

Danville, Ky.—Plans have been under way for an electric light plant for which bids were to be asked. Cost, $30,000. J. C. Boyle, Chairman of Commission.

Dauphin, Man.—An electric light plant may be put in. Town Clerk W. Rintul.

Douglas, Ga.—It was voted to issue $20,000 bonds for an electric plant and water works.

Durand, Mich.—Voted to issue $12,500 bonds for enlarging the electric light system.

Fortville, Ind.—The cost of an electric light plant for this town will be estimated.

Fulton, Va.—It was stated that a company was to be formed among the merchants for the erection of an electric light plant.

Girard, Kan.—It has been proposed to have a $20,000 electric light plant. Mayor W. H. Ryan.

Jamestown, N. Y.—It was stated that $15,000 was voted to improve the electric light plant.

Kittery, Me.—The question of municipal electric lighting has been under consideration.

Macedonia, Ia.—The installation of an electric light plant has been agitated.

Manchester, Va.—It was stated last month that new bids were to be asked for electric machinery for the electric plant to cost $35,000.

Miller's Falls, Mass.—Miller's Falls Water Supply District was to put up an $8,000 electric plant.

Moline, Ill.—Bids for street lighting will be asked as the contract with the Peoples' Power Co. expires February 4, 1904.

Monroe, N. C.—A telephone company will be organized. J. A. Allen.

Mullica Hills, N. J.—Franchise let New Jersey Southern Gas & Electric Traction Co. for gas plant. A. M. Worstall, Witherspoon Building, Philadelphia.

Oldham, Ky.—Oldham Telephone Co., incorporated at $10,000. Joseph Saur and R. B. Cassidy.

Rapid City, Man. Council is considering a municipal electric light plant. D. E. B. Daly, Clerk.

Regina, N. W. T.—Plans have been completed for an electric light and water works plant. John Galt, Engineer, East Toronto, Ont.

Rockhouse, Ky.—Rockhouse Telephone Co. was incorporated at $9,000. John Collins.

Sag Harbor, N. Y.—It was voted to issue $24,000 bonds for an electric light plant.

Seven Valleys, Pa.—Franchise granted Spurgeon Heathcote for electric lighting for borough—28 lights. Will erect a plant.

Sherman, Tex.—Grayson County Telephone Co. will spend $34,000 on improvements.

Sonoma, Cal.—Franchise granted T. C. Ryland for lighting this town.

Walterboro, S. C.—A telephone company has been formed. H. W. Jones.

Wakonda, S. D.—The question of street lights has been under consideration.

Waterbury, Conn.—It was stated that a $5,000 plant was to be installed in the City Hall. City Engineer Cairns.

Whitby, Ont.—A $6,500 electric light plant and water works was to be installed according to reports. R. E. Speakman, City Engineer.

Williamsburg, O.—$12,000 bonds have been appropriated for an electric light plant. Mayor C. H. Lochard.

Williamstown, Ky.—There has been talk of an electric light plant. The Mayor.

Winder, Ga.—It was stated that a $15,000 electric light plant was soon to be put in.

Winnipeg, Man.—It was reported that a new direct current dynamo was to be purchased for the electric light plant.

Wittenberg, Wis.—It is reported that this place voted $18,000 bonds for a municipal electric light plant.

Geneva, Neb.—A $10,000 gas plant is under consideration. City Clerk J. J. Burke.

Hickman, Ky.—The Hickman County Telephone Co. has been incorporated at $5,000 by Thomas Emerson, B. A. Boone, etc.

Lanett, Ala.—Is contemplating the erection of an electric light plant.

Lewes, Del.—Has sold $10,000 bonds for extending the electric light plant and sewers.

Logan, Utah.—May issue $50,000 bonds for a power plant.

Logan, Utah.—Will build a city electric light plant when a site is obtained.

Lunenburg, Va.—The Lunenbrug Telephone Co. has been incorporated and will build systems. A. M. Bruce, Pres.

Lynch, Neb.—Is talking of putting in electric lights.

Nahant, Ia.—Is considering an electric light plant for the city. L. L. Hanson.

New Haven, Ind.—Is considering an electric plant.

Niobrara, Neb.—Is considering the installation of an electric power plant.

No. Tarrytown, N. Y.—Has voted against $21,000 bonds for electric lighting plant.

Owensboro, Ky.—The Rural Home Telephone Co. has been incorporated at $25,000. H. K. Cole.

Philadelphia, Pa.—Congress will be asked to provide funds for $100,000 electric light plant at League Island Navy Yard.

Salem, Ia.—Have voted to build a gas plant.

Sandusky, O.—The Sandusky Gas and Electric Co. will spend $100,000 on improvements.

Santa Ana, Cal.—May sell $60,000 bonds for an electric light plant. City Clerk Tedford.

Sansalito, Cal.—A franchise for an electric light plant has been let to Thomas G. Frost.

**Shell Lake, Wis.**—A gas plant may be installed here.

**Taylorville, Ill.**—A franchise for an electric light plant has been asked for by William J. Mower.

Union, Ore.—Will improve the electric light plant.

Vine Grove, Ky.—Is considering an electric light plant. B. C. Hill.

Waco, Tex.—Has voted against $1,000,000 bonds for an electric light plant.

Wakefield, Mich.—Has voted against bonds for an electric light plant. J. W. Bedell, Pres.

Wall Lake, Ia.—The press reports state that a gas plant will be put in.

Weldon, Ill.—The city will probably buy an electric light and water works plant.

Whiltesburg, Ky.—The Whitesburg Telephone Co. have been formed at $2,000 to build a line to Stonega, Va. D. D. Fields, Mgr.

Wilmington, N. C.—The Interstate Telephone Co. will improve the exchange and put in a metallic circuit. W. W. Shaw, Mgr., Durham, N. C.

### Contracts Awarded

Bay City, Mich.—Warren Electric Manufacturing Co., New York, received contract for a dynamo, and the National Carbon Co. for furnishing carbons for the coming year.

Eatonton, N. C.—The contract for the electric light plant was awarded. The Mayor.

Gilroy, Cal.—Contract let O. M. Baker for completing the combined oil, water and gas plant for city.

Haverhill, Mass.—Contract awarded Haverhill Electric Co. for lighting streets at $102.50 per arc per year.

Hubbard, O.—Contract awarded to Christ. Loughlin for erecting light plant.

Lincoln, Neb.—Contract awarded Western Electric Co. for a dynamo for penitentiary, and to Cox & Phelps for engine and dynamo.

Newtown, Pa.—The Welsbach Street Lighting Co. has contract for street lighting at $30 per light per year.

Olympia, Wash.—It is reported that Kilbourne-Clark Co., Seattle, received contract for light plant at Capitol at $10,500.

Oshawa, Ont.—Contract let T. G. Deverall for power house for electric light plant at $5,155.

Roslyn, N. Y.—Contract awarded Nassau Light & Power Co. for street lighting at $15 per light per year.

Sandersville, Ga.—Contract awarded Nisbet Wingfield, Augusta, for the electric light and water plant.

Seattle, Wash.—The Wagner-Bulloch Electric Co., of San Francisco, has contract for generator equipment for municipal plant at $17,686.

Sioux Falls, S. D.—Contract awarded F. D. Mills & Sons for new city power house building at $10,000.

South Bend, Ind.—Contract awarded the South Bend Electric Co. for lighting the city for ten years at $78.75 for lamps in center of street; with wires underground, $95 a year; wires overhead, $83; incandescent lamps, 50 candle power, $32 a year.

Steelton, Pa.—Contract let Steelton Heat, Power & Light Co. for street lighting at $53 per light per year.

Troy, O.—Contract let Hobart Electric Manufacturing Co. for electric light plant at county court house at $5,047.

York, Pa.—Contract awarded Edison Electric Light Co. for street lighting at 11 cents per lamp per night.

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## PUBLIC BUILDINGS

Altamont, Ill.—It is stated that a $20,000 school in District No. 6 will probably be erected.

Atlanta, Ga.—Plans have been prepared for two schools to cost about $35,000.

Bartlesville, Ind. Ter.—$20,000 bonds were voted for schools.

Benton, Ark.—A $10,000 school will be erected. The Mayor.

Benton, Mich.—A new city hall has been discussed. Mayor Gillette.

Birmingham, Ala.—It was reported that a vote was to be taken on bonds for a high school.

Buena Vista, Ga.—Marion County is to erect a $5,000 jail. County Clerk Lowe.

*(Continued on page 30.*


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Fred J. Kern, Mayor.

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E. S. Dalton, City Clerk.

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City of Schenectady, N. Y.

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H. W. Cheadle, City Clerk.

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"By resolution No. 1852, adopted by the City Council of the City of Omaha, on July 14, 1903, I was directed to order twenty-five copies of the Municipal Journal and Engineer to be sent monthly to the attached addresses of city officials, all said copies to be delivered at the City Hall, Omaha, Neb."

W. H. Elbourn, City Clerk.

"Enclosed find General Fund Warrant of the City of Omaha in payment of subscriptions to the Municipal Journal of New York. I take a great deal of interest in your publication, and think that every city official should be a subscriber, and the subscription paid for by the municipality, in order that public officials may become more familiar with their respective duties.

John N. Westburg, Controller.

**Detroit, Mich.**

"Send the Municipal Journal and Engineer to the attached list of councilmen and city officials. We enclose affidavit blank, which you will please execute and return with your bill to this office."

F. A. Blades, Controller.

**Sheboygan, Wis.**

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John F. Armstrong, City Clerk.

**Phœnixville, Pa.**

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Canyon City, Tex.—A $12,000 school was to be erected by Canyon City School District.

Chattanooga, Tenn.—Mayor Chambliss wants a new high school.

Chester, Pa.—A new city hall has been under consideration.

Columbus, O.—Will erect a $50,000 school on Fourth avenue. Board of Education.

Dublin, Ga.—Plans for the Carnegie Library are being made by Harrison Bleckley, Atlanta.

East Orange, N. J.—Plans for the Fifth Ward school were accepted by the Board of Education.

Emporia, Kan.—It was stated that new bids would be asked for the public library. Van Brunt & Hown, architects, Kansas City, Mo.

Geneva, N. Y.—Plans for the new Federal building have been prepared.

Hubbard, O.—It was decided to erect a new jail.

Huntington, W. Va.—Plans have been prepared for the new post office and court house to cost $140,000. Parker & Thomas, architects.

Indianapolis, Ind.—An appropriation has been made for a new jail to cost $33,000. Commissioner Cowgan, Lawrence County.

Iowa City, Ia.—Bids are wanted on December 9 for the erection of a post office. J. K. Taylor, Treasury Department, Washington, D. C.

Kountze, Tex.—It was stated that a vote would be taken on the issue of $50,000 bonds for Hardin County court house. County Clerk.

Lafayette, Ga.—Bids are wanted December 3 for a new jail to cost $15,000. J. W. Golneke, architect, Atlanta.

Lakeport, Ia.—Bids are wanted December 1 for a school. D. C. May.

Lewisburg, Tenn.—$100,000 has been appropriated for a new court house.

Live Oak, Fla.—Plans for the $40,000 court house accepted from B. B. Smith, Montgomery, Ala. Bids are wanted on December 7. County Commissioners.

Macon, Ga.—A vote will be taken on December 8 on the issue of $20,000 bonds for a public library. The Mayor.

Madison, Wis.—Plans are prepared for the remodeling of the Capitol. Cass Gilbert, architect, 111 Fifth avenue, New York City.

Newkirk, O.—Will vote on December 1 on $6,000 bonds for a jail. County Clerk.

Newport, R. I.—County Commissioners voted to erect a $20,000 jail.

Oakland, Cal.—Plans prepared for a $350,000 city hall.

Paterson, N. J.—Plans have been completed for a new police station to cost $40,000.

Penn Yan, N. Y.—A $20,000 addition to the high school will be erected.

Perry, Ga.—Bids ar wanted December 1 for the enlargement of Houston County court house. Blair & Kern, architects, Macon.

Port Huron, Mich.—The erection of a $200,000 court house is being discussed. S. E. Pearce.

Saginaw, Mich.—Will issue $40,000 school bonds for East Side school.

St. George, N. W.—It was stated that bids were soon to be asked for a $150,000 borough building. Borough President Cromwell.

Slayton, Minn.—Cottonwood County voted $50,000 for a court house.

Springfield, Mass.—The County Commissioners have been considering plans for an addition to the court house.

Towner, N. D.—Bids are wanted on January 25 for a jail.

Urbana, Ill.—Plans for a new jail will probably be prepared.

Vincennes, Ind.—Plans have been made for a post office to cost $75,000. Vonnegut & Bohn, Indianapolis.

Waltham, Mass.—A new city hall has been discussed. Alderman Whitcomb.

### Contracts Awarded

Albany, N. Y.—Maurice Mead was low bidder for new engine house No. 5 and public bath house at $51,000.

Baltimore, Md.—Lowest bid for engine house No. 24 was from C. L. Stockhouse at $15,962.

Boonville, Ind.—Contract awarded Howar Bros., Danville, Ill., for new court house at $63,900.

Charleston, S. C.—Clark Construction Co., 2 Sherman street, Chicago, bid lowest for building No. 1 in Navy Yard at $37,500.

Clarion, Pa.—Contract for county poorhouse let Wm. Zortman, Pittsburg, at $69,500.

Clebourne, Tex.—Contract for Carnegie Library let E. J. Zimmerman at $19,424.

Columbus, O.—Contract awarded Bert Welter for East Side market house at $19,877.

Dover, N. H.—Lowest bid for public library was from W. A. Sargent, of Concord, at $20,450.

El Paso, Tex.—C. A. Peterson & Co. has contract for addition to Sunset school at $11,999. Contract let Hewett & Jones for addition to Mesa school.

Harrisburg, Ill.—Contract awarded Ford & King for court house at $29,386

Hastings, Neb.—Lowest bidder for new post office was L. S. Atkinson at $78,922.

Hemphill, Tex.—Contract let John Thompson, St. Augustine, for jail.

Kirksville, Mo.—Contract let C. Stafford Building & Construction Co., St. Louis, for post office at $40,000.

Lawrenceburg, Ky.—Contract awarded C. E. Bond for school at $12,500.

Livingston, Mont.—Contract let H. J. Wolcott for new library at $9,750.

Lynchburg, Va.—Contract awarded J. T. Wilson, Richmond, for Federal building at $82,000.

New York, N. Y.—Contract let Francis Sullivan, 103 East 125th street, for addition and alterations on School 29, Bronx, at $113,900.

*(Continued on page 31.)*


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Pittsfield, Mass.—Contract awarded Foote & Jones, Westfield, for school at $37,700.

St. Paul, Minn.—Contract awarded Otis Elevator Co., for two elevators in State Capitol at $20,000.

Seattle, Wash.—Contract let McCarth & Duhame for court house and post office to cost $605,000.

Sherbrooke, Que.—Contract for court house let Paquette & Gadbois, St. Hyacinthe, at $130,000.

Waxahatchie, Tex.—Contract awarded Stephenson Construction Co., Dallas, Tex., for library at $22,000.

Wilmington, N. C.—A. J. Robbins, Southport, received contract for erecting New Brunswick County jail at $6,738.

Winneboro, La.—Contract awarded F. B. & W. S. Hull for court house at $24,143.

## SEWERS

Altoona, Pa.—Will issue $225,000 bonds for construction of sewers.

Ansonia, Conn.—A sewer system has been discussed. Mayor Charters.

Austin, Tex.—$17,000 appropriated for storm sewer in Congress avenue.

Bellevue, Ky.—The citizens are in favor of a sewer system.

Billings, Mont.—Two miles of sewer on Sixth avenue, estimated to cost $16,500, were to be built.

Collinwood, O.—Sewers are to be built in Sanitary Sewer District No. 1. C. J. Moses, Clerk.

Colton, Cal.—It was proposed to build a $35,000 sewer system.

Des Moines, Ia.—Resolutions called for 12-inch pipe sewers in Bowman avenue. City Clerk E. R. Bennett.

Ensley, Ala.—It was stated that bonds would be issued for sanitary and storm sewer system.

Eureka Springs, Ark.—A complete sewer system has been under consideration. City Engineer Pendleton.

Fitchburg, Mass.—It was reported that a system of sewers and filtration beds would be constructed at a cost of $445,091.

Gloucester, N. J.—It was voted to issue $10,000 bonds for sewers.

Guttenburg, N. J.—It is stated that bids are to be asked for a main outlet sewer. Mayor Lentz.

Hackensack, N. J.—Plans for sewer in Campbell avenue have been accepted. Engineer Williams.

Halifax, N. S.—The City Engineer recommended a $35,000 sewer.

Hickory, N. C.—It was voted to issue $90,000 bonds for sewers, water works and street improvements.

Iola, Kan.—A system of storm sewers will probably be built. City Engineer L. P. Stover.

Joplin, Mo.—The Council has been talking of a sewer system.

Kewanee, Ill.—It was reported that the city would spend $130,000 on improving the sewer system.

Lansdowne, Pa.—Plans have been prepared for sewer improvements. Robert Green, Engineer.

Little Rock, Ark.—An ordinance was passed providing for sewers in three streets.

Lorain, O.—Bids are asked for December 6 for storm sewers in Oberlin avenue. Clerk, Board of Public Service.

Louisville, Ky.—Seventeenth street is to be sewered at a cost of $1,200.

Macon, Ga.—Will vote December 8 on $40,000 bond issue for a sewer systen. The Mayor.

Montclair, N. J.—It is stated that an extension of 8-inch pipe sewer in length 2,500 feet, will be made. F. Crane, Engineer.

Montreal, Can.—A sewer system was proposed for three streets. City Surveyor Barlow.

Northampton, Mass.—Plans were received by the State Board of Health for the extension of the sewer system.

Oakland, Cal.—The city engineer is preparing plans for sewers in three streets.

Okmulgee, Ind.—It was voted to issue $15,000 bonds for sewers.

Oxford, O.—The estimated cost of a sewer system was $30,000.

Portland, Ore.—Resolution called for sewers in several streets.

Red Wing, Minn.—A sewer system has been under discussion. City Engineer Danforth.

Rochester, N. Y.—Resolution called for a sewer in Chatham and Harrison streets. City Clerk Pulver.

St. Paul, Minn.—The estimated cost of sewer system for St. Anthony Park was placed at $60,000.

San Diego, Cal.—It was stated that bids might be asked for the extension of the sewer system. City Engineer Hernecourt.

San Francisco, Cal.—A resolution was passed providing for an outlet sewer in 36th street.

San Jose, Cal.—It was stated that bids were to be asked for sewer in N. Whitney street. City Clerk.

So. Manchester, Conn.—It was voted to build a sewer system to cost $18,000 in the 8th School District.

Springfield, Ill.—The estimated cost of extending the Allen street sewer 4,000 feet placed at $16,000.

Springfield, O.—A vote is to be taken on a sewer system. City Engineer Sieverling.

Syracuse, N. Y.—Considering the construction of sewers to cost $11,600.

Topeka, Kan.—Plans for sewers have been prepared. City Engineer McCabe.

*(Continued on page 32.)*


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Westerly, R. I.—A movement has been started for construction of a sewer system. Town Clerk Wm. Hoxsey.

Woburn, Mass.—An appropriation of $2,500 has been made for sewers in Jefferson avenue.

### CONTRACTS AWARDED

Bangor, Pa.—Ed. H. Post, Wilkes-Barre, has contract for 1,500 feet of 24-30 inch pipe sewers.

Buffalo, N. Y.—Contract awarded Beaser Bros., 73 Sanford street, for 24-inch brick and 20 and 188-inch tile sewers in New So. Ogden street. Contract let to Thomas Dark & Co. for trunk sewer in five streets. W. G. Smith was low bidder for sewer in Philadelphia avenue.

Fort Smith, Ark.—Contract awarded Bruce Bros. for extending sewer system at $10,000.

Jonesboro, Ind.—Contract awarded F. M. Benner, Marion, for sewers in several streets at $1.03 per lin. foot and $17 per manhole.

Kingston, N. Y.—John O'Reilly received the contract for sewers in three streets at $9,929.

La Junta, Colo.—Contract let J. Johnson for extending main sewer.

Muscatine, Ia.—Contract awarded Day & Dugan for sewer in Sub-sewer Dist. 1.

Providence, R. I.—Contract awarded F. E. Shaw for 2,685 ft. of 20 to 66-inch brick sewer.

Rome, N. Y.—Contract awarded Frank George for sewer at $1,152.

South Bend, Ind.—Peter Sugio has contract for concrete sewer in Fassnacht avenue, at $35,000.

So. Norwalk, Conn.—Contract awarded E. Chioppa, Westport, for sewer in three streets.

Ticonderoga, N. Y.—Contract let Patrick McCoughin for sewer in two streets.

West Duluth, Minn.—P. McDonnell was the only bidder for trunk sewer, at $21,651.

Westfield, Mass.—Contract awarded E. B. Roberts, Swampscott, for about 2,800 feet of brick sewer.

West Orange, N. J.—Contract for section No. 1 of outlet sewer transferred from Harrison Constr. Co. to Gun M. Gest of New York.

York, Pa.—Peter E. Garrety has contract for terra cotta sewers to cost $6,200.

Youngstown, O.—Contract awarded John Grady for sewer in Dallas avenue at $3,139.

## WATER SUPPLY

Aiken, S. C.—$30,000 bonds will be issued for extending the water works and sewerage.

Allentown, Pa.—It was voted on November 3 to issue $125,000 bonds for water works. L. W. Mitchell, City Clerk.

Ashtabula, O.—Discussing the question of municipal water works.

Augusta, Me.—Report of appraiser in Waterville water case places value of Maine Water Co.'s plant at $503,475.37, which the Kennebec Water District must pay for plant.

Bardstown, Ky.—It was voted to issue $24,000 for water works.

Bellaire, O.—The sum of $90,000 may be spent on water mains. A. J. Harbaugh, Supt. Water Works, Talking of establishing $8,000 crib filtering system near pumping station.

Brunswick, Mo.—It was voted to issue $5,000 bonds for enlarging the water works and light plant.

Canon City, Colo.—The estimated cost of gravity system of works placed at $120,000.

Carlisle, Ky.—It was voted to issue $25,000 bonds for water works. The Mayor.

Chihuahua, Mex.—The estimated cost of water works placed at $500,000. Ponciana Aquilar, Engr.

Cloquet, Minn.—$50,000 bonds were issued for water works.

Danville, Ky.—It was voted to issue $20,000 bonds for improving water works, including filter. The Mayor.

Douglas, Ga.—It was voted to issue $20,000 bonds for water works and electric light plant.

Dubois, Pa.—The water mains may be extended in the spring. Sec'y of Council.

Fargo, N. D.—$9,000 have been appropriated for improvements to the water works.

Franklin, Tenn.—The question of water works has been under discussion. Mayor C. R. Berry.

Gadsden, Ala.—A vote will be taken on Jan. 19 on $100,000 bonds for water works. The Mayor.

Groveland, Mass.—The estimated cost of a water system placed at about $57,740. C. A. Woodbury, Chairman Water Com.

Harrisburg, Pa.—It was stated that plans would be drawn for a water filtration plant.

Lawton, Okla. Ter.—Plans for water works to cost $70,000 have been prepared. The Mayor.

Madison, Wis.—$20,000 bonds for building and extending water works will be issued.

Magnolia, Miss.—It was voted to issue $25,000 bonds for water works. The Mayor.

*(Continued on page 33.)*


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Masontown, Pa.—Estimated cost of a water works and sewer system placed at $75,000. Chas. V. Hoover.

Meriden, Conn.—It is stated that the Board of Public Works will lay about two miles of 4, 6 and 8 inch iron mains, at a cost of $15,000.

Mianisburg, O.—It was voted to issue $80,000 bonds for water works. City Clerk.

Milton, Ore.—A vote was to be taken on $27,000 bond issue to improve the water works and electric light plant.

Minden, La.—A vote is to be taken, it is stated, on $30,000 bond issue for water works. The Mayor.

Nashville, Tenn.—The question of improving the water supply and water pressure has been under consideration. City Engineer Southgate.

Oak Ridge, La.—It was stated that bids were to be asked for water works. Town Clerk.

Orleans, Ind.—Plans have been prepared for combined water and light plant, to cost about $12,000.

Payette, Idaho.—It was voted to issue $20,000 bonds for water works. City Clerk E. W. Tracy.

Peabody, Mass.—It was voted to appropriate $145,000 for water works improvements.

Phoenix, Ariz.—A vote is to be taken on December 12 on the issue of $300,000 bonds for municipal water works.

Portage la Prairie, Man.—A vote is to be taken at the next general election on the question of putting in water works.

Prophetstown, Ill.—It is reported that $110,000 was voted for water works.

Rutledge, N. J.—Considering the question of a water works system to cost $90,000.

Shawnee, Okla. Ter.—A vote was to have been taken on the issue of $125,000 for extending the water works. The Mayor.

Sheboygan, Wis.—Plans for water works for the city being considered. City Engineer C. V. Boley.

Steubenville, O.—Ordinance called for $50,000 bond issue for extension of mains and a reservoir.

Tillanook, Ore.—Estimated cost of works placed at $50,000.

Vinita, Ind. Ter.—Voted $85,000 bonds for water works and sewers.

Washington, D. C.—Bids are asked December 18 for 18 miles of canal, pipes, tunnels, gates, etc. E. H. Hitchcock, Sec'y, Dep't of Interior.

Woodward, Tex.—Works proposed will consist of 290,000 gallon plant and seven miles of pipes.

### Contracts Awarded

Alexandria Bay, Ont.—Contract awarded Parlow & Woodcock, Fulton, N. Y., for pump house for water works at $4,400.

Alfred, N. Y.—Contract let Ellery Coleby, Oswego, N. Y., for water works plant.

Ballard, Wash.—The lowest bidder for reservoir was Manney & Co., at $5,377.

Blasdell, N. Y.—Contract awarded Darling Pump & Mfg. Co. at $4,499 for valves, hydrants and gate boxes.

Brookville, O.—Contract awarded National Constr. Co., So. Bend, Ind., for compressed air water works system at $23,650.

Capac, Mich.—Contract for water works awarded Walker Mfg. Co., Newton, Mich.

Cary, S. D.—Hess & Rau, Watertown, S. D., has contract for installing water works.

Chinook, Mont.—Contract for water works let W. D. Lovell, Des Moines, Ia., for water works at $20,456. Chicago Bridge & Iron Co. has contract for water tower, at $7,240.

Concord, N. H.—Henry R. Worthington, New York, has contract for duplicate pump for water works.

Freeport, N. Y.—Contract awarded A. R. Applegate & Co., Patchogue, for water system.

Helena, Mont.—Congress Constr. Co. is said to have been the lowest bidder for water pipe and specials, at $46 per ton and 5½ cents, respectively.

Lake Park, Minn.—W. D. Lovell, Des Moines, Ia., has contract for water works at $10,468.

Manassa, Colo.—Contract for drilling well for water supply for town awarded Conejos County Oil Co.

Minden, La.—Contract for water works and sewers awarded General Municipal Constr. Co., Dallas, Tex.

Newton, Ia.—S. V. Deem, Galva, Ill., has contract for water mains.

Reading, Pa.—Contract awarded Geo. W. Beard & Co., for addition to engine at Maiden Creek pumping station, at $12,940.

Sandersville, Ga.—Contract awarded Nisbet Wingfield, Augusta, for water works and electric light plant.

Santa, Rosa, Cal.—Contract let Holly Co., New York, for high duty, crank and fly wheel pumping engine, at $16,775.

Springfield, Neb.—U. S. Supply Co., Omaha, was low bidder for water works, at $7,029.

Washington, D. C.—Holly Mfg. Co., Lockport, N. Y., was low bidder for 2,500,000 gallon pump, at $19,950.

*(Continued on page 35.)*

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Wellington, O.—Contract awarded Thos. Burton for improving water works, etc.

W. Manchester, O.—Contract awarded Nat. Constr. Co., So. Bend, Ind., for completing water works.

Wilmington, Del.—It was stated that the Thompson Co., of Baltimore, received a contract for 1,000 meters.

Yankton, S. D.—Contract for artesian well let Norbeck & Nicholson Co., Redfield.

### MISCELLANEOUS

Akron, O.—A garbage disposal plant has been under consideration. R. F. Hamlin, Clerk.

Allegheny, Pa.—An ordinance called for the purchase of an automatic stoker and smokeless furnace for the water department.

Altoona, Pa.—Press reports state that this city must soon rebuild conduit for sewage waste system.

Ames, Ia.—Contract awarded O. P. Herrick, Des Moines, for sewage disposal plant and about two miles of pipe sewers at $24,287.

Annapolis, Md.—Contract for removing garbage and street sweepings awarded James E. Feldmeyer.

Bakersfield, Cal.—$35,000 bonds voted for new fire engines, engine house and fire alarm system.

Belleville, Mo.—The estimated cost of an intercepting sewer system and septic tank placed at $80,000. City Engr. Graner.

Birmingham, Ala.—A sewage purification plant has been under consideration. T. J. Molton, Comr.

Bridgeport, W. Va.—It was stated that the Council might buy some fire hydrants.

Buffalo, N. Y.—H. P. Burgard was low bidder for receiving chambers and pumping pits for sewage station, at $32,000.

Chester, O.—Will soon form volunteer fire department. Councilman Anderson.

Chicago, Ill.—A reduction system for the disposal of garbage may be installed. Alderman W. J. Rayner.

Cleveland O.—The Newburg Reduction has a one-year contract for disposal of city garbage, at $60,000.

Corning, N. Y.—Proposed to have fire alarm system for the North Side, to cost about $2,500. Trustees of Fire Dept.

Dayton, O.—Contract for the disposal of garbage, night soil, etc., awarded the Sanitary Reduction Co. Clerk Bd. of Public Service.

Fitchburg, Mass.—Preparing plans for sewer system and disposal works. City Engineer D. A. Hartwell.

Grand Rapids, Mich.—The garbage crematory may be enlarged at a cost of about $10,000. Health Officer T. M. Koon.

Greensburg, Pa.—A garbage crematory has been under consideration.

Hamilton, Ont.—A garbage incinerating plant is wanted. City Engr. Barrow.

Homestead, Pa.—Contract awarded the Dixon Crematory Co., Toledo, O., for a garbage furnace at $8,500.

Hudson, Mass.—The installation of sewage disposal and sewer system has been under consideration.

Knoxville, Tenn.—A fire department is to be organized and equipped. The Mayor.

Lodi, N. J.—The borough of Lodi has organized a fire department. A. C. Bass.

Louisville, Ky.—Contract for fire alarm system with the Gamewell Fire Alarm Telegraph Co. approved.

Marion, Ind.—A new garbage plant has been under consideration.

Martins Ferry, O.—It is stated that, on Nov. 3, it was voted to issue $10,000 bonds for a garbage crematory.

Memphis, Tenn.—Plans for a $6,000 engine house are ready. City Engineer Omberg.

Newark, N. J.—Plans have been under way for a proposed house for a new truck company.

New Haven, Conn.—The Board of Health has asked for a $20,000 garbage plant.

Newport, Ky.—Chief Waters asked for a new engine and house for the East End.

*(Concluded on page 36.)*


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Norfolk, Va.—The fire headquarters may be improved.

Oakland, Cal.—Board of Public Works was toask for bids for en engine house.

Passaic, N. J.—Bids will be asked for garbage collection.

Pittsburg, Pa.—Contract awarded the American Reduction Co. for collecting and disposing of garbage at $89,949.

Riverside, Cal.—A steam fire engine and a quantity of hose may be purchased.

Rome, N. Y.—Contract for garbage collection relet to D. R. Watkins.

St. Paul, Minn.—The fire commissioners have been talking of putting in new fire alarm boxes.

Sumter, S. C.—Information was asked concerning garbage crematories, street sweepers, sanitary carts, etc. Health Officer E. I. Reardon.

Tampa, Fla.—Contract awarded the Decarie Manufacturing Co., Minneapolis, Minn., for a garbage crematory, at $15,700.

Vicksburg, Miss.—City has accepted the plans made for the garbage crematory. City Clerk.

Washington, D. C.—The District Commissioners ask for $357,400 for street cleaning and disposal of refuse. May spend $1,907,000 on sewers and sewage disposal system.

*(End.)*


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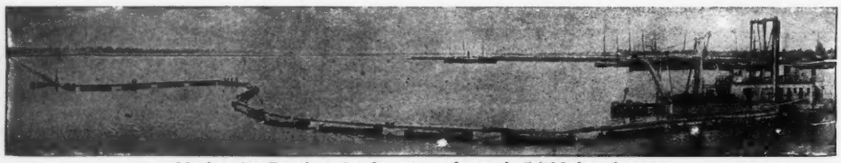

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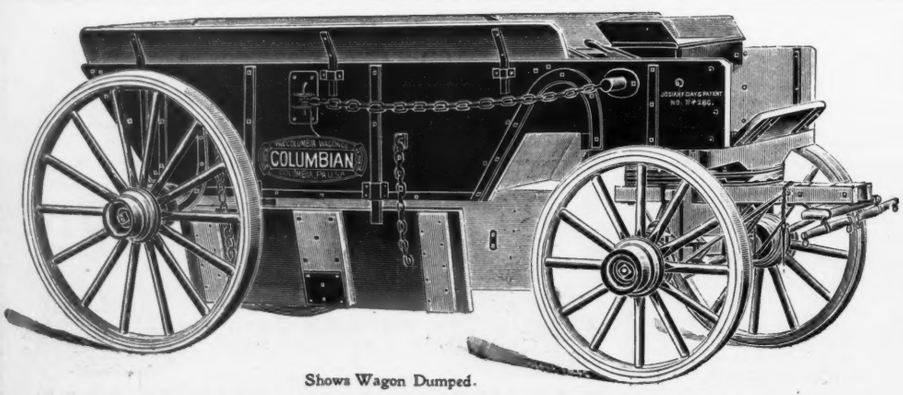


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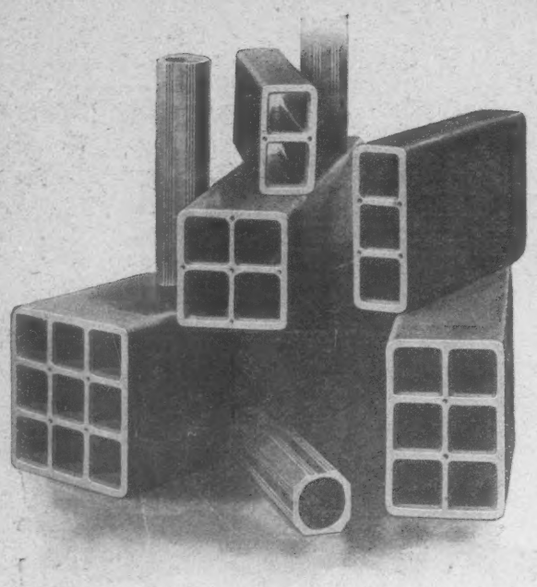

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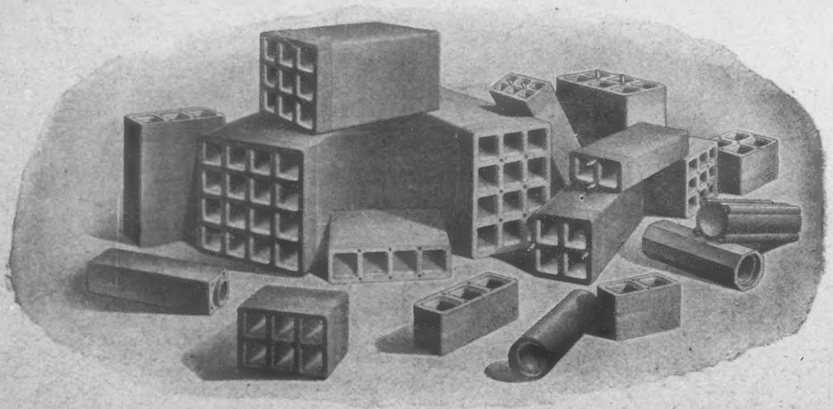

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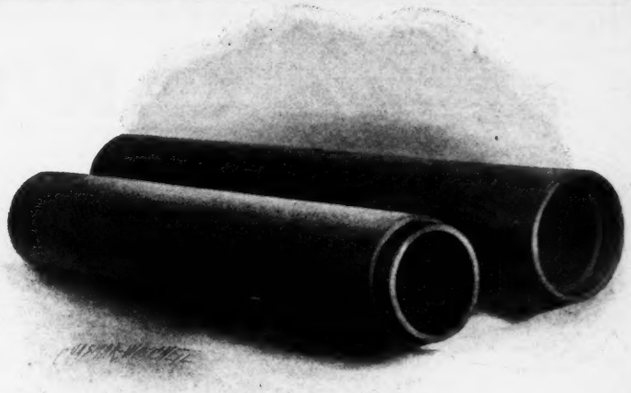

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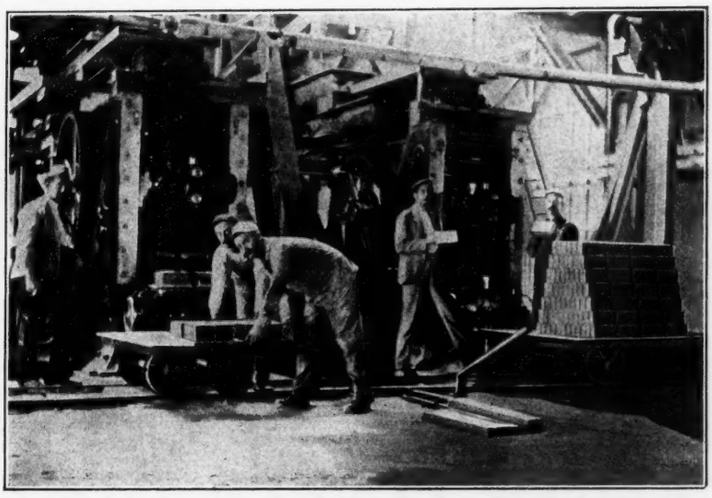

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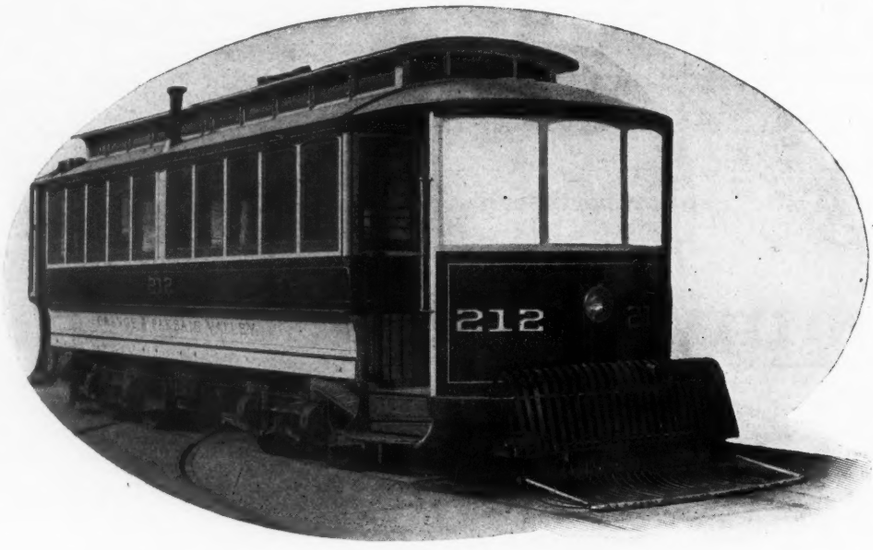


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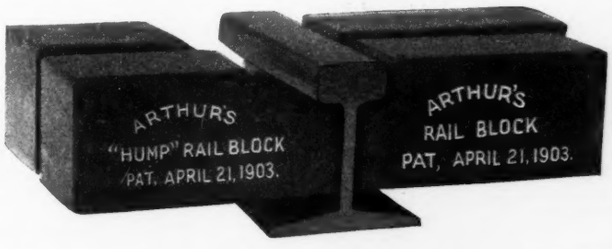


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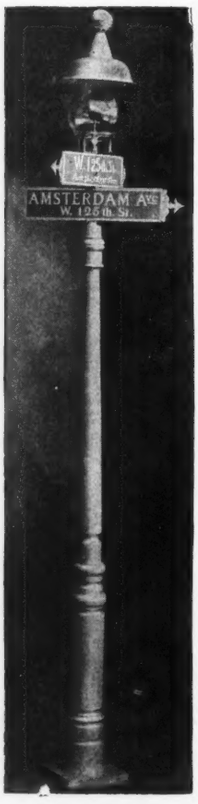


# Index to Advertisers.

**Buyers' Guide and Classified Business Directory, Page 16.**

Acme Road Machinery Co..... 55
Alexander, Bradley & Dunning.... 45
Allis-Chalmers Co. ..... 44
American Conduit Co..... 3
American Fire Engine Co..... 15
American Road Roller Co..... 40
American Sewer Pipe Co..... 51
American Steel House Co..... 6
American Vitrified Conduit Co..... 2
Armstrong Iron Co..... 35
Arthur, W. H..... 5
Art Metal Construction Co..... 9
Atlantic, Gulf & Pacific Co..... 36
Austin-Western Co., Ltd..... 40

Bacon Air Lift Co..... 35
Barber Asphalt Paving Co..... 55
Barstow, W. S..... 33
Bartlett, C. O., & Snow Co..... 43
Berger Mfg. Co..... 8
Big Four Route..... 10
Brown & Fleming..... 35
Buffalo Cement Co., Ltd..... 35
Buffalo Meter Co..... 18
Buffalo-Pitts Steam Roller Works 41
Byerley & Son..... 55

Caird, Jas. M..... 32
Camp Co., H. B..... 2
Carpenter Company, F. E..... 18
Central Bitulithic Paving Co..... 53
Chicago Fire Hose Co..... 15
Child, Stephen ..... 33
Christensen Engineering Co..... 5
City Wastes Disposal Co..... 32
Cleveland Vapor Light Co..... 13
Collinwood Shale Brick Co..... 49
Colt, J. B., Co..... 12
Columbia Wagon Co..... 36
Columbus Meter Seal Co..... 18
Conard, W. R..... 35
Consolidated Car Fender Co..... 4
Contractors Supply & Equipment Co. 45

Decarie Manufacturing Co..... 34
Diggs Fire Extinguisher Co..... 14

East Ohio Sewer Pipe Co..... 50
Ericsson Telephone Co..... 18
Eureka Fire Hose Co..... 15
Evens & Howard Fire Brick Co.... 49

Fabric Fire Hose Co..... 60
Fanning, J. T..... 32
Field, C. J..... 10
Fire Extinguisher Mfg. Co..... 15
Fisher's Hydraulic Stone System... 42

Galesburg Paving Brick Works.... 49
Gamewell Fire Alarm Telegraph Co. 14
General Fireproofing Co..... 8
Gest, G. M..... 35
Glazier Universal Nozzle Co..... 60
Globe Asphalt Co..... 55
Gregory, Elisha ..... 33
Guelich, Otto E. C..... 55

Harper Norton Shale Brick Co..... 49
Hawkes, Thomas ..... 33
Hering, Rudolph, & Geo. W. Fuller 32
Howard, J. W..... 33
Huennekes Co., H..... 3
Imperial Expanded Metal Co..... 37
Ingram-Richardson Mfg. Co..... 6
International Pavement Co..... 35
Iowa Engineering Co..... 32

Keasbey Co., Robt. A..... 55
Kelly-Springfield Road Roller Co... 41
Krag Metallic Construction Co..... 8
Kuichling, Emil ..... 32

La France Fire Engine Co..... 15

Maslins ..... 45
McAvoy Vitrified Brick Co..... 48
Meacham & Wright..... 45
Medina Quarry Co..... 43, 47
Menzies Street Cleaner Co..... 38
Metropolitan Paving Brick Co..... 48
Monarch Acetylene Gas Co..... 12
Moore, E. H..... 35
Morse-Boulger Destructor Co..... 37
Mott Iron Works, J. L..... 13
Municipal Engineering Co..... 32

Nashville Roofing & Paving Co..... 55
National Electric Co..... 5
New York Cent. & Hud. River R. R. 7

Okonite Co., Ltd..... 60

Pacific Flush Tank Co..... 18
Pennsylvania Globe Gas Light Co.. 10
Perkins, Frank C..... 33
Pittsburg & Buffalo Co..... 47
Pittsburg Meter Co..... 18
Preston Brick Co..... 49
Purington Paving Brick Co..... 48
Republic Chemical & Creosoting Co. 52

St. Louis Clay Burning Co..... 48
Sanitary Street Sweeping Co..... 38
Scholl & Co., Julian..... 41
Schwarz System Brick Co..... 10
Seagrave Co., The..... 14
Shadbolt Mfg. Co..... 36
Smith-Premier Typewriter Co..... 7
Southern Pacific Railway..... 7
Springfield Paving Brick Co..... 49
Standard Vitrified Conduit Co..... 2
Standard Water Meter Co..... 18
Stevens Cast Stone Co..... 42
Stroud & Co., E. H..... 38
Studebaker Bros. Mfg. Co..... 39

Texas & Pacific Coal Co..... 49
Truss Metal Lath Co..... 37
Tyrrell, H. G..... 33

U. S. Sanitary Co..... 45
U. S. Wood Preserving Co..... 53

Vulcan Iron Works, Toledo, O..... 35

Walker, H. B..... 45
Warren Asphalt Paving Co..... 54
Warren Bituminous Paving Co.... 58
Warren Bros. Co., Philadelphia, Pa. 58
Warren Bros. Co..... 56, 57, 59
Welsbach Street Lighting Co..... 11
Wheeler & Co., W. H..... 33
Wight & Co., W. N..... 37
Williams & Whitman..... 33
Willson & Co., H. B..... 35
Wise & Watson..... 32

Yagle & Co., Wm., Ltd..... 45

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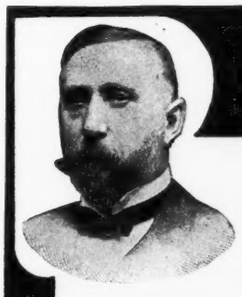

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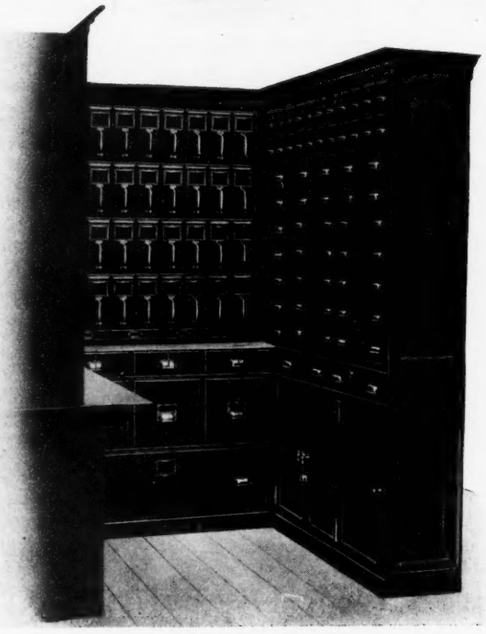

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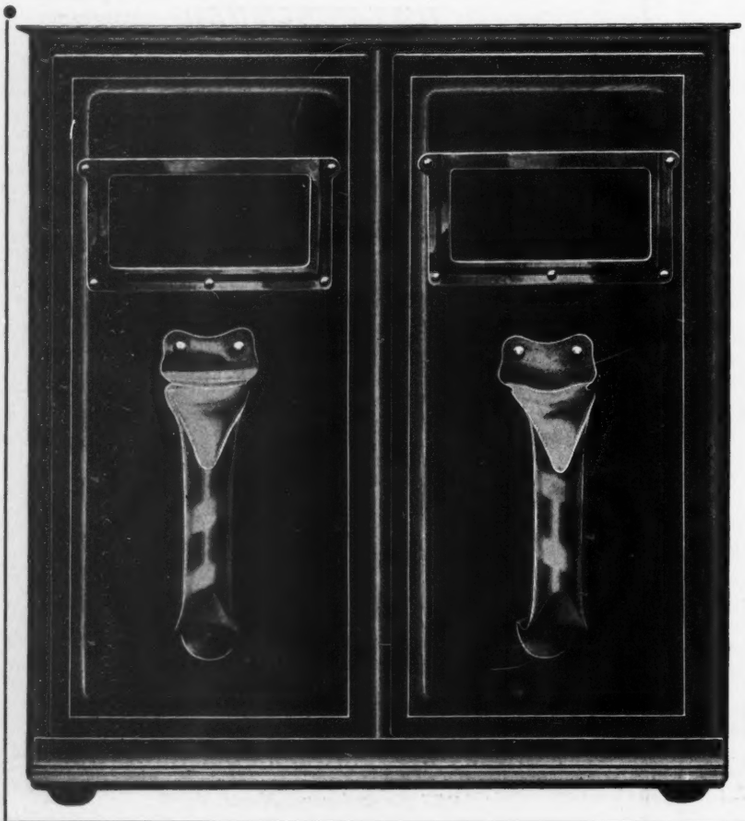

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## TABLE OF CONTENTS FOR DECEMBER, 1903


### CONTRIBUTED ARTICLES

The Parks of New Bedford..... 227
Our Special Correspondent.
Municipal vs. Contract Construction..... 230
James M. Head.
Development of Kreodone Wood Pavement..... 234
P. C. Reilly.
Sewage Disposal in Providence..... 236
Our Special Correspondent.
Sewage Disposal ..... 238
Rudolph Hering, C. E.
Springfield's Underground Water Supply..... 240
L. Walter Harrison.
Raising Water with Compressed Air..... 245
Philip R. Björling.
Water Consumption in American Cities..... 249
E. Kuichling.
Fireproofed Wood for Building..... 263
Prof. Ira H. Woolson.

### GENERAL ARTICLES

Water Supply of Mobile..... 239
Mobile's Engineer Reports on Wood Paving.... 241
Methods of Disinfection in Capital City..... 251
Electrolysis in Providence..... 258
Success of Municipal Insurance Scheme..... 259
Annual Meeting of Health Association..... 260
Mobile to Sell Railway Franchise..... 260
Chicago's Proposed Railway Ordinance..... 261
Poster Art in Politics..... 261
Meeting of Indiana Municipal League..... 262
Statistics of Arc Lighting in U. S. Cities and Towns ..... 262
Houston's New Central Fire Station..... 265
To Provide Against Danger from Fire..... 265
Automobile Regulations in Cities..... 255
Pavements of Paris..... 274

### EDITORIALS

Appeal for Reduction of Dust Nuisance..... 252
Severence Burrage.
Cheap Telephones in Sweden..... 253
A Trick of the Asphalt Trust..... 253

### LETTER TO THE EDITOR

A Novel Plan for Municipal Betterment..... 254

### NEWS AND PRACTICE AMONG THE CITIES ..... 256

High Sign Boards Prohibited.
Another Trial at Oiling Roads.
Better Meat Inspection in Saginaw.
The Year's Work in Montgomery.
Work of Butte's City Engineer.
No Municipal Lighting Plant in New Orleans.
Wants Right to Control Its Streets.
New Garbage Ordinance in Dayton.
Telephone Rates Reduced and Increased.
Milwaukee to Be Rid of Smoke Nuisance.

### PERSONALITIES ..... 254

### WHAT THE POLICE AND FIREMEN ARE DOING..... 266

### LITERATURE ON MUNICIPAL TOPICS..... 268

### ITEMS OF INTEREST TO THE TRADE

Acetylene for Municipal Lighting..... 270
New Field for Sand-Lime Brick..... 271
An English Earl's Opinion..... 271
Omaha May Lay Its Own Pavement..... 271
City and Contractor Carts..... 272
Items of Interest About the Trade..... 273
A New Disc Meter for Water Service..... 273
Record Freight Run..... 273
The Hand Pick-Up Street Sweeper..... 273
What a Conduit Should Be..... 274
Publications Received ..... 274

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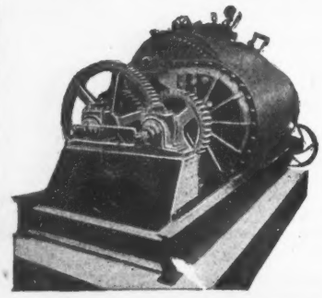

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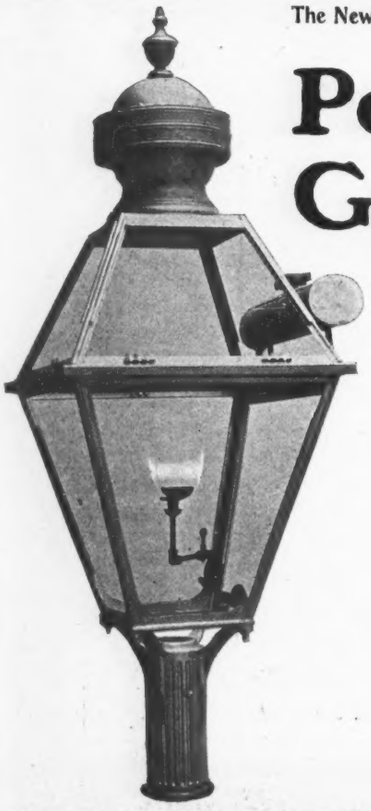

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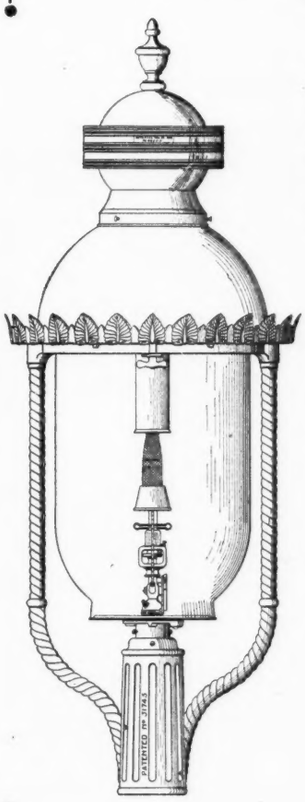

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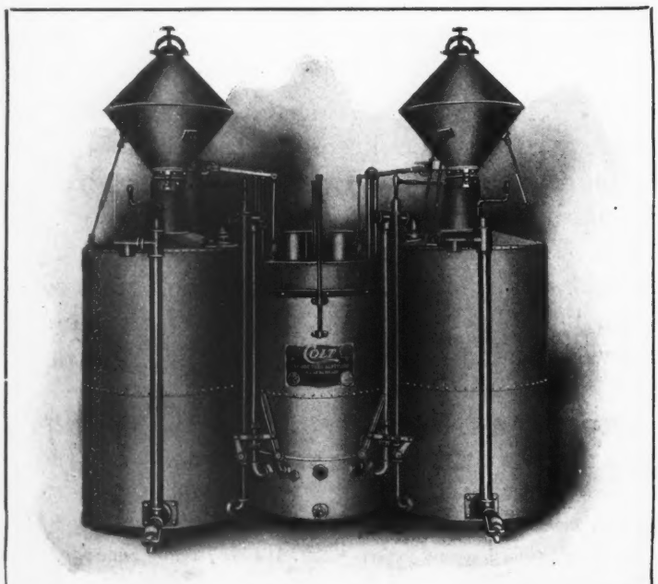

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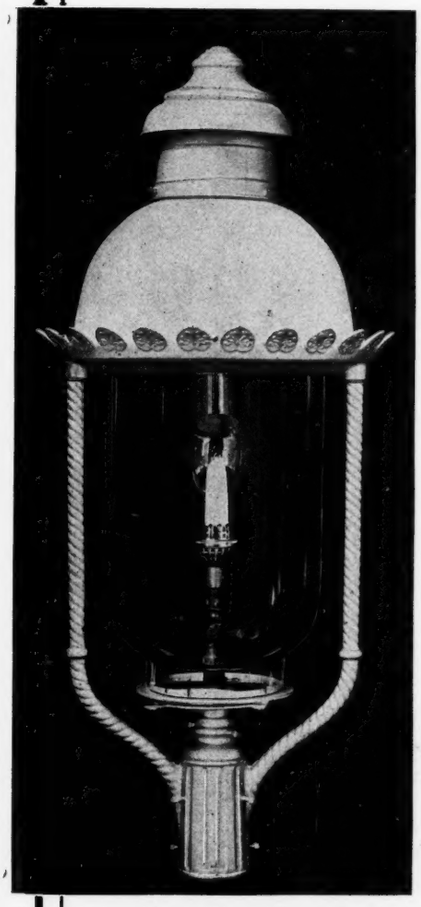

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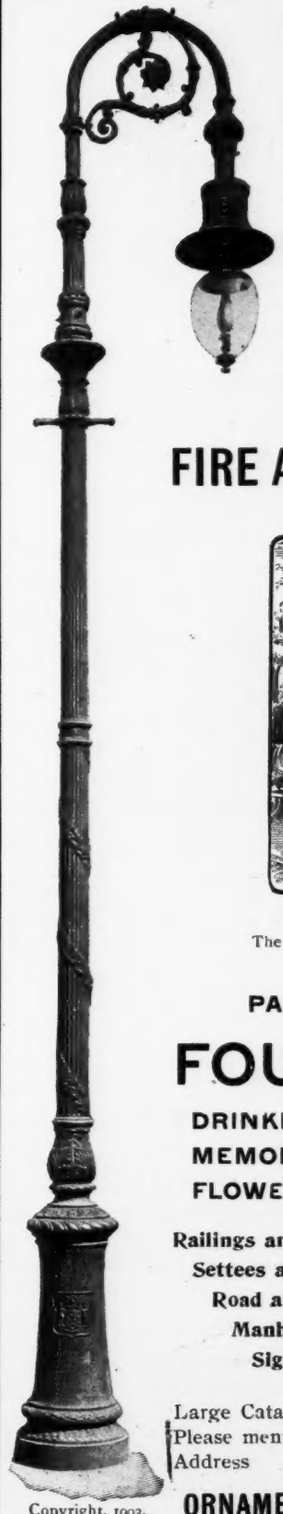

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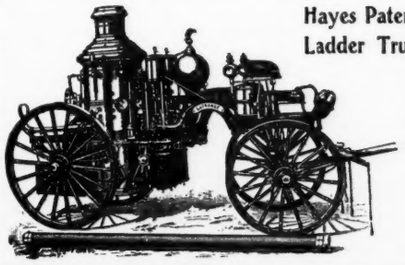

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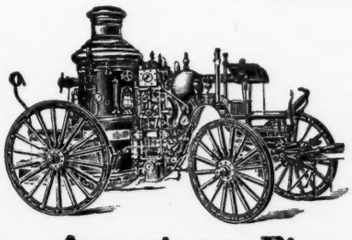

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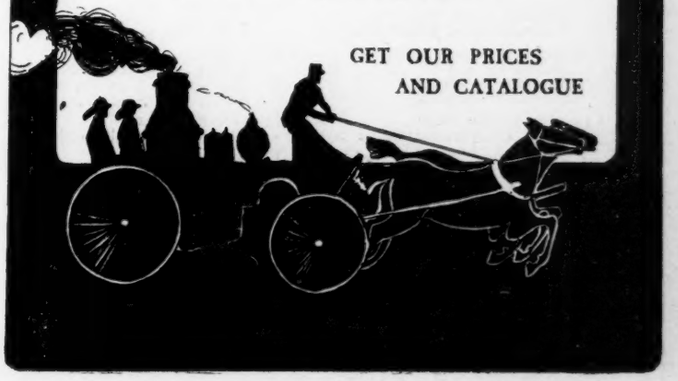

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**Index to Advertisers, on Page 6.**

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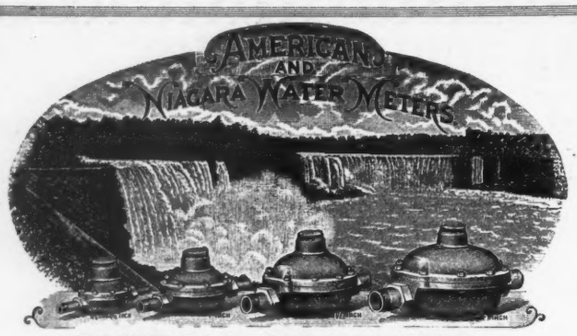


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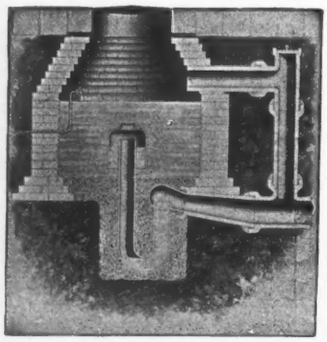

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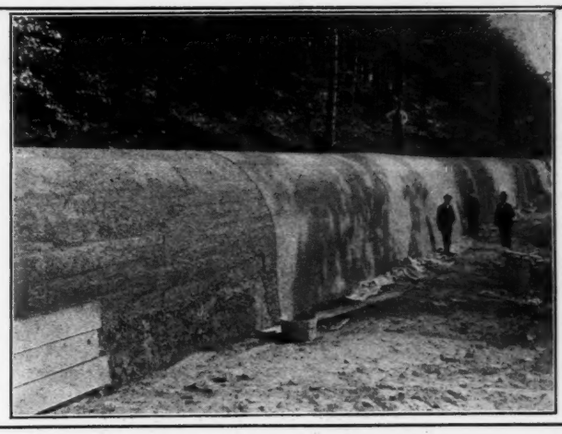

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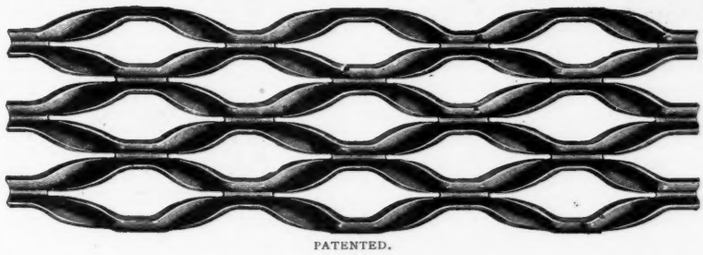

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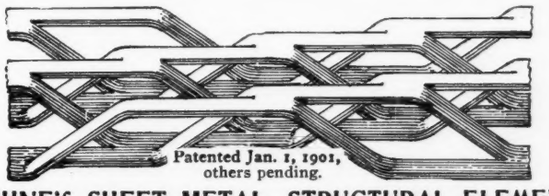

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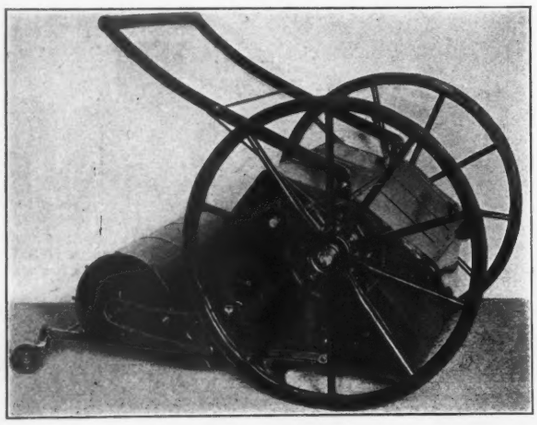

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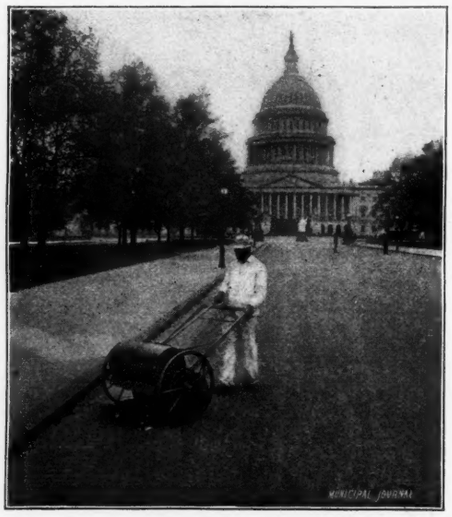

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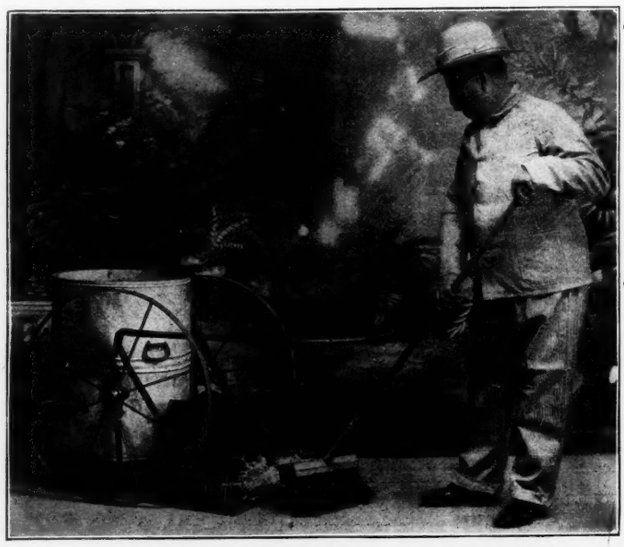

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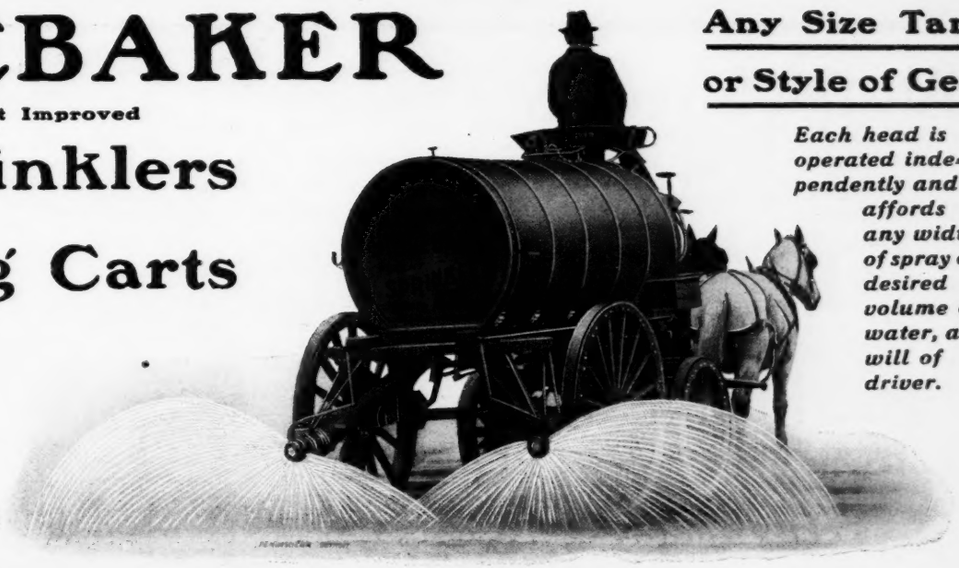

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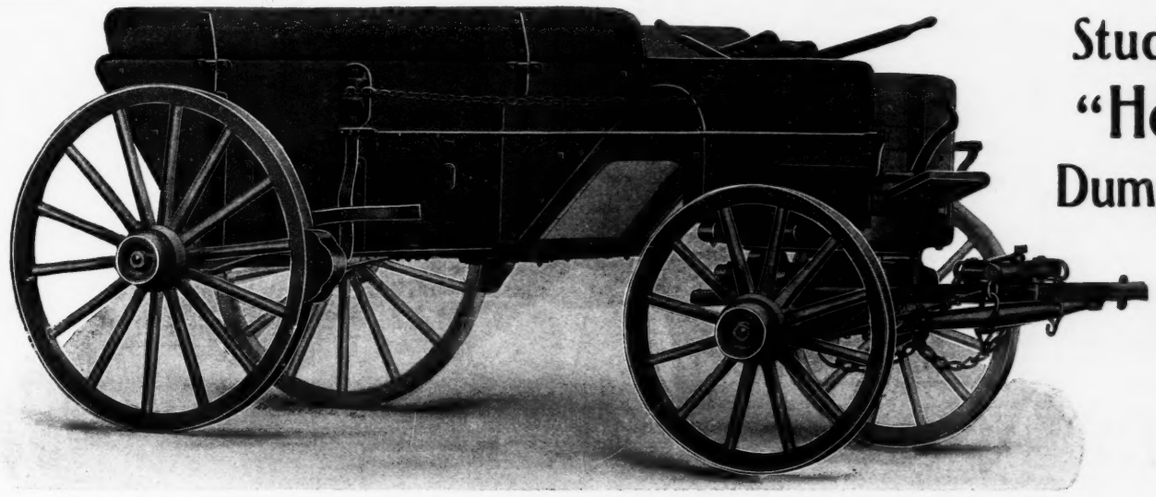

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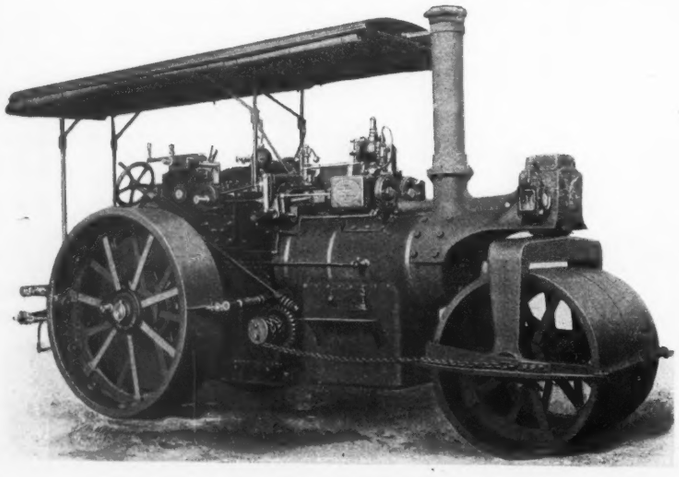

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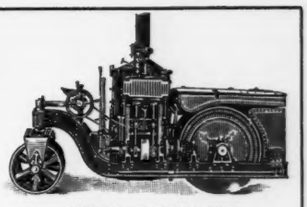

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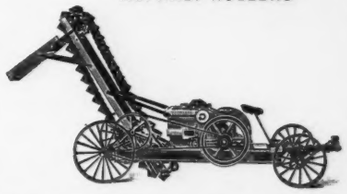

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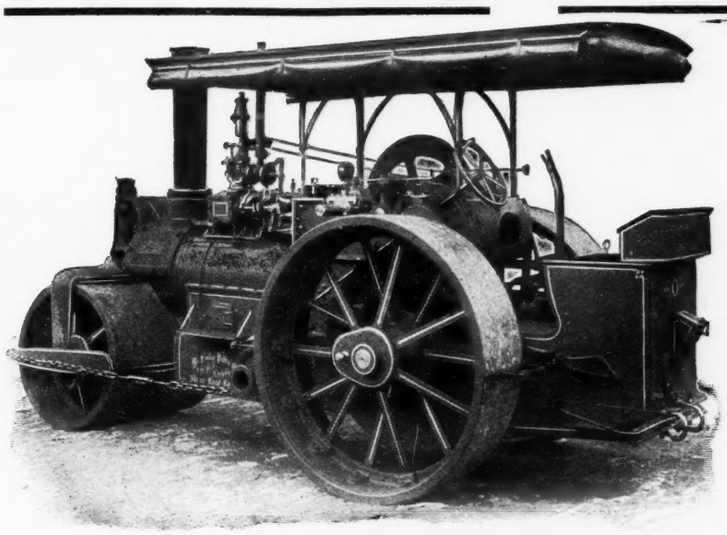

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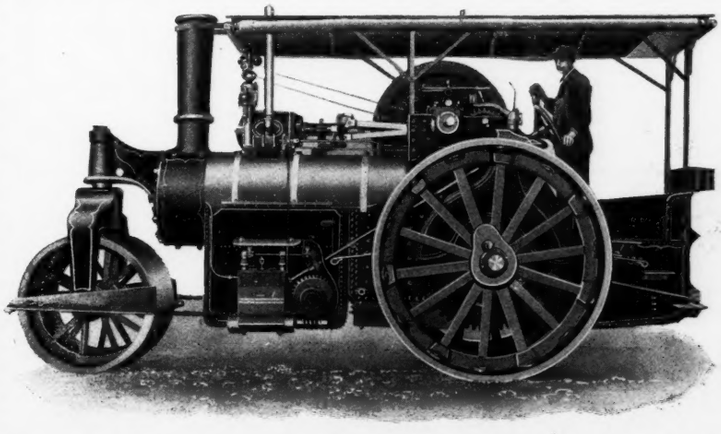

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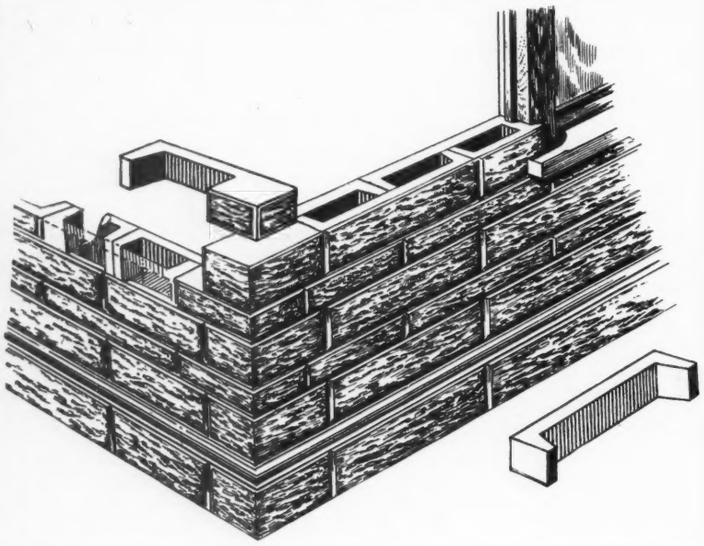

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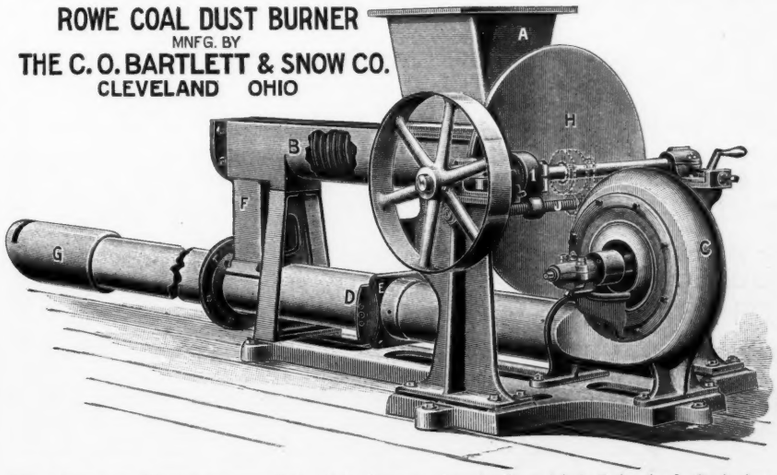


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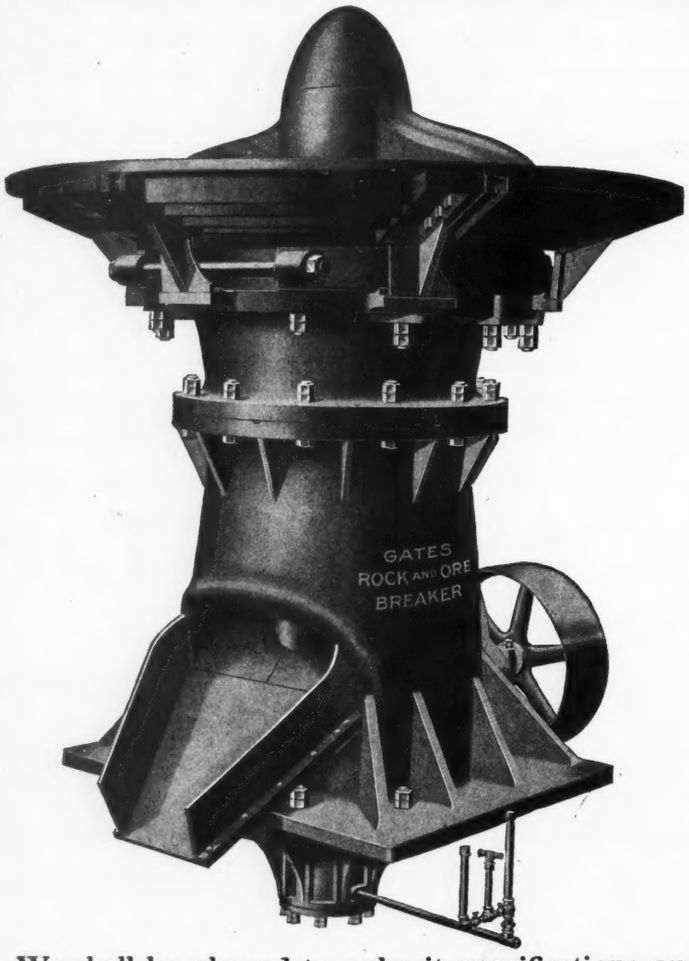


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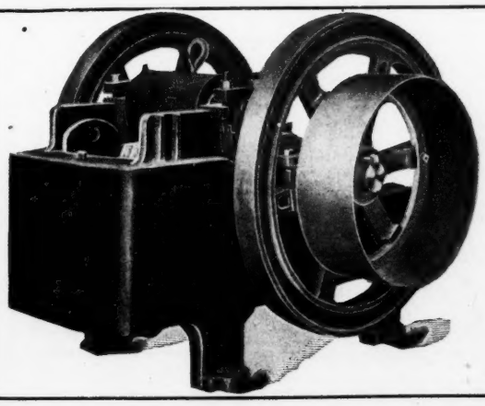

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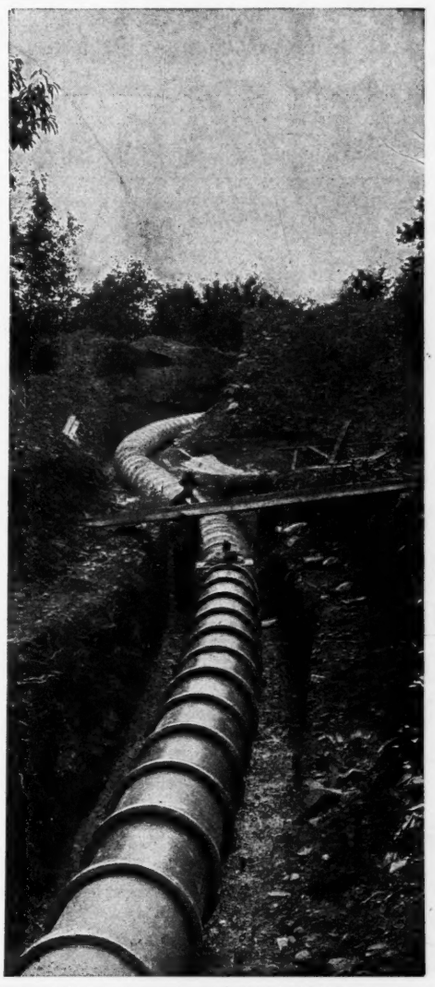

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**We have laid Warren's Bitulithic Pavement in Port Huron, Bay City and Saginaw, Mich., Newport, Ky., and Ironton, Ohio, and have contracts in Kalamazoo, Manistee, and Mt. Clemens, Mich., and Cincinnati, Ohio.**

**It fulfills the most essential requirements and is in fact**

## THE IDEAL PAVEMENT

"The method of construction, the apparent stability and beauty of the street, appealed to us at once, and the words of praise we heard for it from the residents of the streets, officials of the city and citizens generally, led us to take interest in it.

"We also have a letter from Port Huron, signed by both the Superintendent of Public Works and the Mayor, stating that this pavement is giving entire satisfaction even to their old time inveterate kickers."

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**Contains no soluble salts or dirt. Does not require admixture of still wax or parafine oil, or bitumen of another class, to give it the proper consistency. Does not rot. Is a fine natural asphalt. Furnished in any degree of hardness as desired for any purpose.**

**Will Give Territorial Rights on Reasonable Terms. Laboratory Work, Expert Advice and Asphalt Paving Plants Furnished.**

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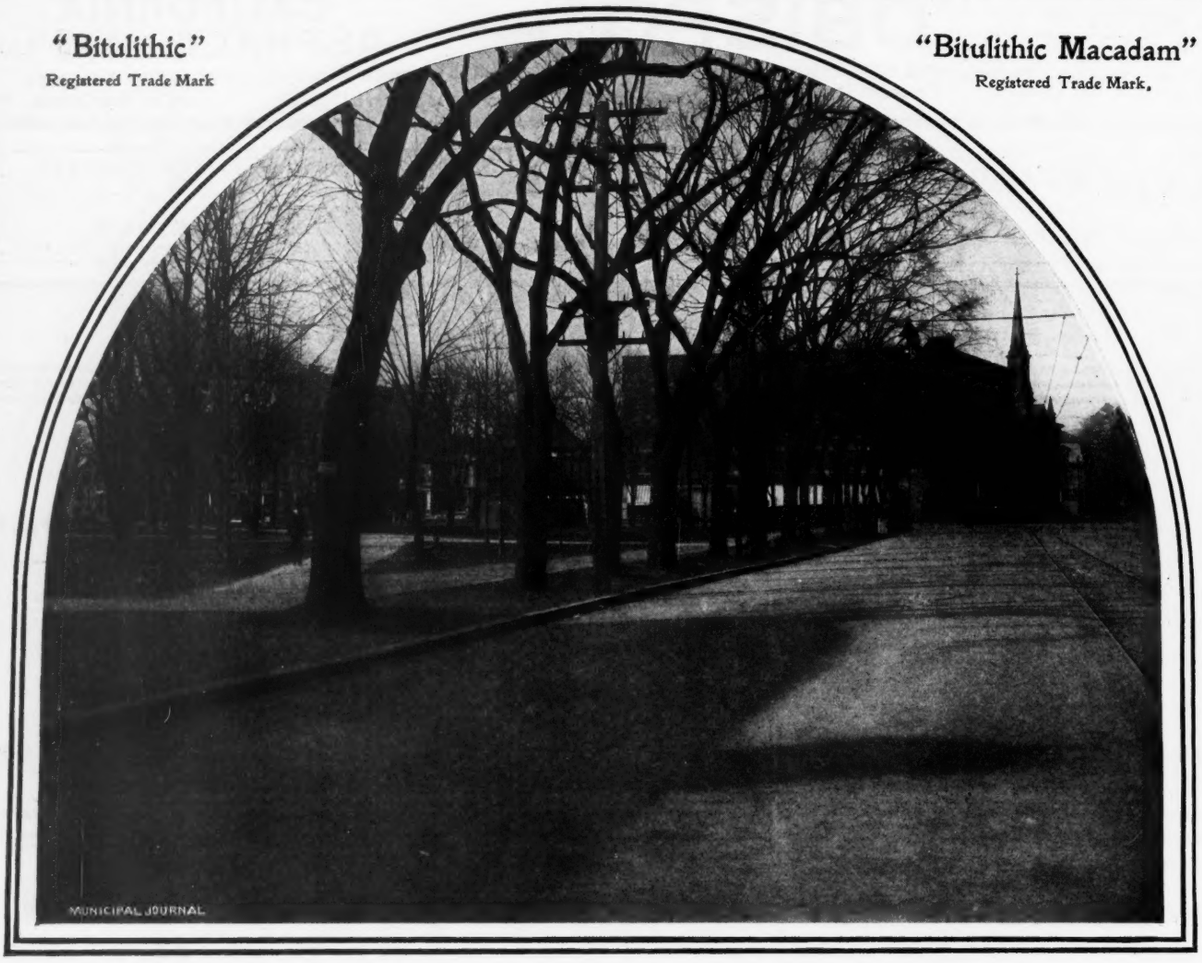


WARREN'S BITULITHIC PAVEMENT, MAIN STREET, WALTHAM, MASS.

## Why Warren's Bitulithic Pavement is Superior to Asphalt.

HARD stone instead of sand takes the wear. The stone permits the use of a softer tempered bitumen—one with more life—it fills all voids and is not subject to attack by air and water

The stone offers a surface just rough enough for horses, yet smooth enough to be noiseless and makes the least slippery pavement ever laid. Is in successful use on 12 per cent. grades. The Bitulithic Pavement will outlast asphalt or macadam. Is sanitary, noiseless, non-slippery, dustless, will not rot nor disintegrate, and superior to either asphalt or macadam pavements under any and all conditions.

Some 50 cities have specified and contracted for this pavement.

Wherever laid City Officials are enthusiastic in its praise and unhesitatingly pronounce it the nearest approach to an ideal pavement ever produced.

WARREN BROTHERS COMPANY

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MAIN ST.
WORCESTER, MASS.
PAVED WITH
WARREN'S PATENTED
BITULITHIC PAVEMENT.

## Why Warren's Bitulithic Pavement is Superior to Macadam.

STONE is used as in macadam to provide structural strength, but the sizes are assorted so that the finer will fill the voids of the coarser, consequently more stone is used.

Furthermore, every space is filled with Warren's Puritan Brand of Bituminous Cement, which is waterproof.

The stone cannot be dislodged as in macadam. The surface cannot wash away or grind from friction and may be swept and cleaned.

The finest stone used in the Bitulithic Pavement to fill voids is mixed with bitumen and is a waterproof mortar. Dry weather and traffic does not convert it to dust, nor wet weather to mud.

The Bitulithic Pavement is always in good condition, dry or wet.

Our Pavement Patents are valid because stone has never been used before in predetermined proportion and mixed with bitumen.

Our Apparatus Patents are valid because no device has ever been arranged before for screening stone after it is dried. We separate the stone into seven sizes and use by exact weight.

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IS

**SUPERIOR TO ALL OTHER BITUMINOUS OR ASPHALT PAVEMENTS**

We have constructed this pavement on Talbot Street and Peter Street, London, Ontario, and earnestly solicit inspection of the work by officials and taxpayers interested in street pavements.

During the past year this pavement has been laid and contracted for in over

**SIXTY CITIES**

in the United States and Canada to the extent **of over 1,000,000 square yards.**

"The Warren Bros Co. have solved the problem of permanent pavement."—W. J. EVANS, Assistant Street Commisioner, Toronto.

Correspondence solicited from all parts of Canada. Information given and descriptive circulars sent on application.

## THE WARREN BITUMINOUS PAVING CO., OF ONTARIO, Ltd.

**Branch Office,**
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**London, Ontario.**

**Head Office,**
**158 Bay Street,**
**Toronto, Ontario.**

# More than 700,000 square yards of Warren's Bitulithic Pavement

**Were Contracted for the past year.**

**IT APPEALS ALIKE TO PROPERTY OWNERS AND ROAD DRIVERS, IS DURABLE, SANITARY, NOISELESS, WATERPROOF, NOT SLIPPERY, DOES NOT CRACK, UNEQUALLED FOR HEAVY GRADES, WILL NOT DISINTEGRATE**

**"So satisfactory is our piece of Warren Pavement that we shall, at the earliest possible day, re-surface our four miles of ordinary macadam with that material.---JOSEPH H. BELL, Street Commissioner, Salem, N. J."**

**"It is giving, and I believe will continue to give, better satisfaction than any other pavement we could have laid.---S. CAMERON CORSON, City Engineer, Norristown, Pa."**

**Agency for Eastern Pennsylvania and New Jersey.**

## Warren Brothers Company,

**Harrison Building, Fifteenth and Market Sts., PHILADELPHIA, PA.**

**Bitulithic.**
(Registered Trade-Mark)

**Bituminous Macadam.**
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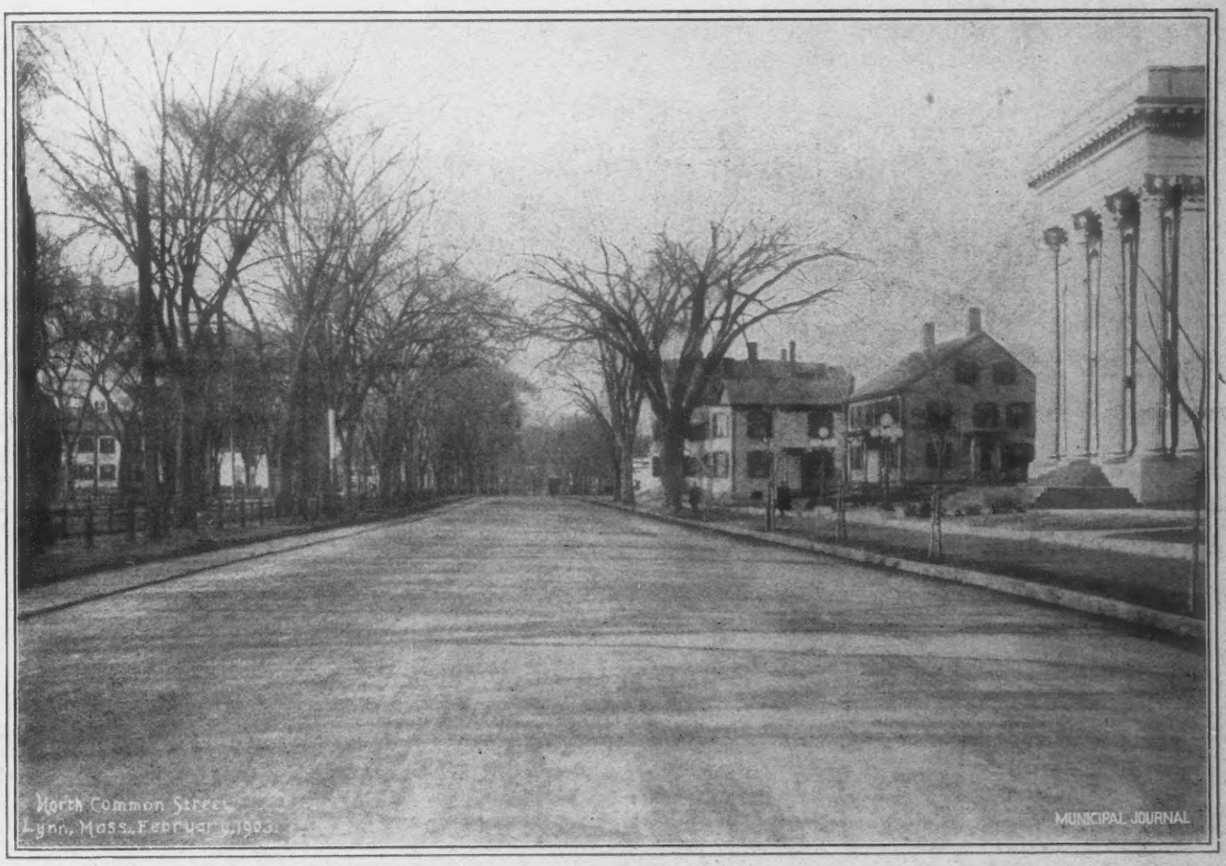
# BITULITHIC

(Registered Trade Mark)

*The Best Form of Warren's Bituminous Macadam Waterproof Pavement*

IT

## WILL NOT ROT OR DISINTEGRATE




**North Common Street, Lynn, Mass. Paved with Warren's Bitulithic Pavement.**

Over 60 cities have specified and contracted for this pavement during the past year, to the extent of over 1,000,000 square yards.

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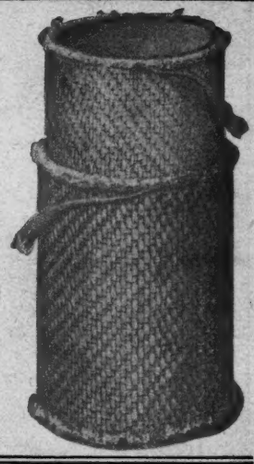

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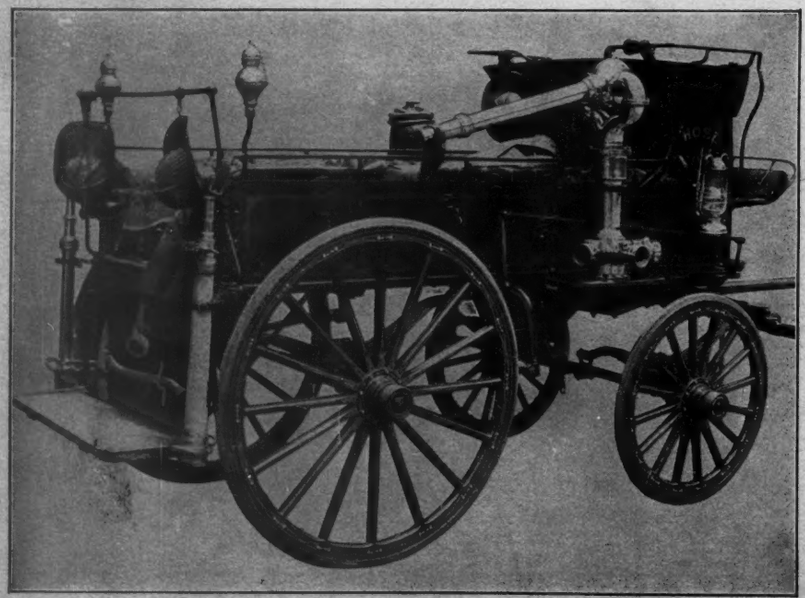
# GLAZIER UNIVERSAL NOZZLE COMPANY



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